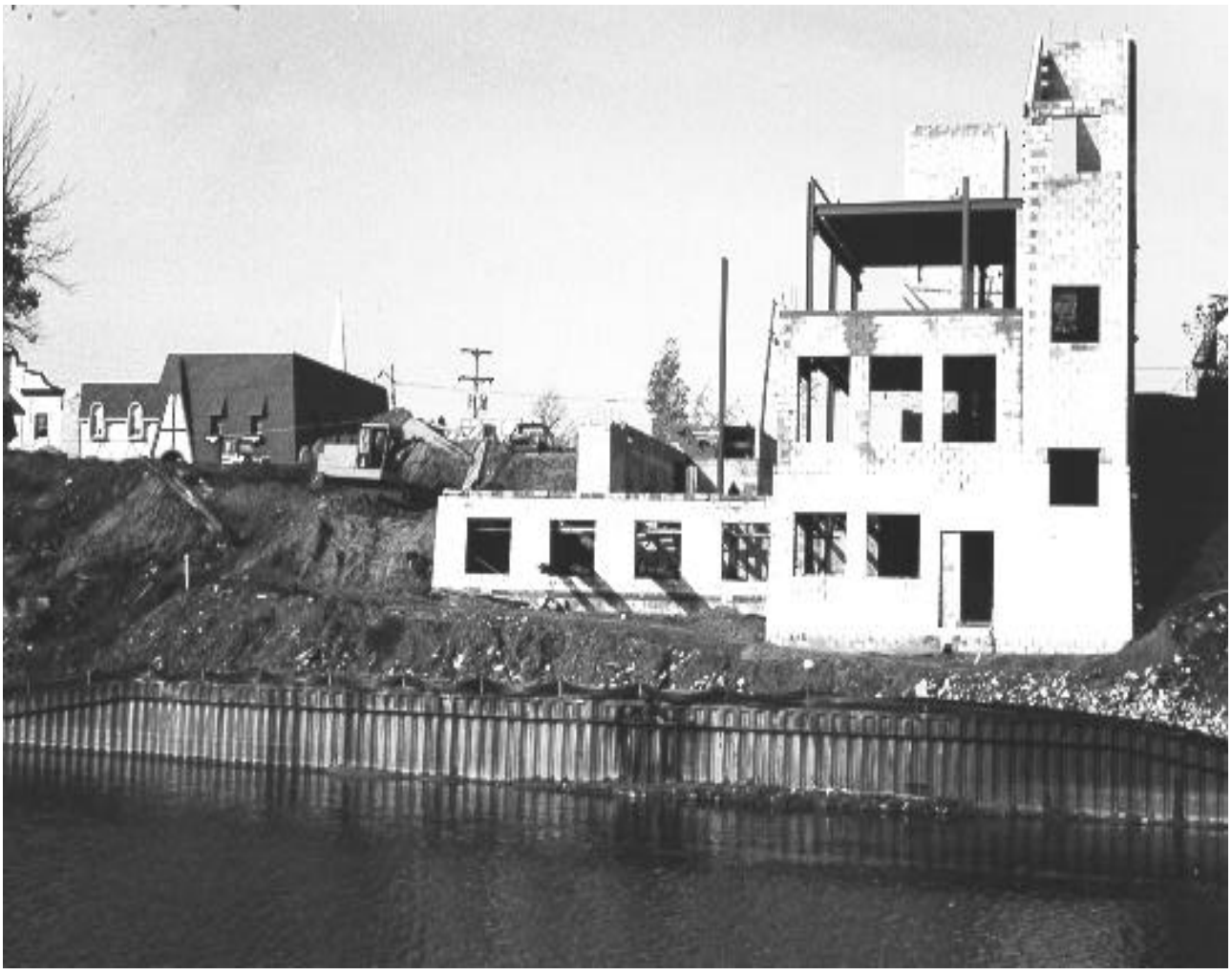
Appendix A – Sample Plan

SAMPLE PLAN FOR THE (INSERT COMMUNITY NAME)

Introduction to the Sample Plan

The Sample Plan outlined in this Appendix provides as an example of what might be included in a stand-alone local hazard mitigation plan. The suggested format and contents are not requirements, but using them will result in a plan that covers hazard mitigation thoroughly and fits well with the Michigan Hazard Mitigation Plan. The Sample Plan is written from an integrated, all hazard approach. Instructional language has been placed in shaded boxes for easy identification.



Sample Plan Table of Contents

Sample Letter of Transmittal from Chief Elected Official

(Date)

(Organization)
(Name)
(Title)
(Street Address)
(City), MI (Zip Code)

Dear Mr./Ms.:

Attached is the (insert community name) Hazard Mitigation Plan. This plan has been developed in conjunction with involved agencies, the state of Michigan, affected businesses, and interested members of the public. The plan provides the process for evaluation of land use and development in the (insert community name) from a hazard mitigation perspective, which will protect lives and property in the community. This correspondence serves notice that it is my expectation that all future development decisions in (insert community name) will consider hazard vulnerability reduction as a standard business practice. The intent of the hazard mitigation plan is not to limit development, but to ensure that all development avoids the possibility of damage from natural and technological hazards to the extent practicable.

Questions and concerns related to content and use of this plan should be directed to (name) of the (insert name of applicable local agency).

Sincerely,

(Chief Executive)
(Chief Executive Title)

The letter of transmittal is intended as a cover letter in delivery of the plan and to convey the message that the chief executive fully supports hazard mitigation planning and expects the plan to be carried out in its entirety. It is important to state that the intent of the plan is not to curtail development, but to channel it into areas that will not pose undue risk to the owner or occupant, or cause undue need for disaster response by local, state and federal agencies.

Sample Preface

Hazard mitigation is any action taken before, during, or after a disaster to permanently eliminate or reduce the long-term risk to human life and property from natural and technological hazards. It is an essential element of emergency management, along with preparedness, response, and recovery. There is a cyclical relationship between the four phases of emergency management. A community prepares for a disaster, and then responds when it occurs. Following the response, there is a transition into the recovery process, during which mitigation measures are evaluated and adopted. This, in turn, improves the preparedness posture of the community for the next incident, and so on. When successful, mitigation will lessen the impacts to such a degree that succeeding incidents will remain incidents and not become disasters.

Hazard mitigation strives to reduce the impact of hazards on people and property through the coordination of resources, programs, and authorities so that, at the very least, communities do not contribute to the increasing severity of the problem by allowing repairs and reconstruction to be completed in such a way as to simply restore damaged property as quickly as possible to pre-disaster conditions. Such efforts expedite a return to "normalcy"; however, replication of pre-disaster conditions results in a cycle of damage, reconstruction, and damage again.

Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced. Through a combination of regulatory, administrative, and engineering approaches, losses can be limited by reducing susceptibility to damage. Hazard mitigation provides the mechanism by which communities and individuals can break the cycle of damage, reconstruction, and damage again.

Recognizing the importance of reducing community vulnerability to natural and technological hazards, the (insert name of community) is actively addressing the issue through the development and subsequent implementation of this plan. The many benefits to be realized from this effort - protection of the public health and safety, preservation of essential services, prevention of property damage, and preservation of the local economic base, to mention just a few - will help ensure that (insert the name of community) remains a vibrant, safe, and enjoyable place in which to live, raise a family, and conduct business.

The preface serves as a lead in to the hazard mitigation plan. Hazard mitigation is not a well known term, but the principles of hazard mitigation are commonly used. Expand upon the description provided as necessary to give insight as to the impetus for hazard mitigation planning in your jurisdiction.

Sample Acknowledgments

This plan is the culmination of our interdisciplinary and interagency planning effort that required the assistance and expertise of numerous agencies, organizations, and individuals. Without the technical assistance and contributions of time and ideas of these agencies, organizations and individuals, this plan could not have been completed. Following is a list of key contributors to the plan:

Agency
Names

Agency
Names

Organization
Names

Private Citizens
Names

*Acknowledgments should give credit to **any** individuals that were key supporters or who played a contributing role in the development of the plan. It is especially important to recognize the efforts of private organizations and the public in development of the plan. Acknowledgment of key external participants is not only appropriate, but may also build support during plan implementation.*

If appropriate, develop a paragraph to describe exemplary contributors.

Sample Executive Summary

The (insert community name) Hazard Mitigation Plan was created to protect the health, safety, and economic interests of the (insert community name) residents and businesses by reducing the impacts of natural and technological hazards through hazard mitigation planning, awareness, and implementation. The plan serves as the foundation for hazard mitigation activities and actions within the (insert community name). Implementation of recommendations will reduce loss of life, destruction of property, and economic losses due to natural and technological hazards. The plan provides a path toward continuous, proactive reduction of vulnerability to hazards which result in repetitive and oftentimes severe social, economic and physical damage. The ideal end state is full integration of hazard mitigation concepts into day-to-day governmental and business functions and management practices.

This plan employs a broad perspective in examining multi-hazard mitigation activities and opportunities in the (insert community name). Emphasis is placed on hazards which have resulted in threats to the public health, safety and welfare, as well as the social, economic and physical fabric of the community. The plan addresses such hazards as floods, tornadoes, windstorms, winter storms, forest fires, structural fires, hazardous material incidents, and secondary technological hazards which result from natural hazard events. Each hazard is analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigative action. The plan also lays out the legal basis for planning and the tools to be used for its implementation.

The Executive Summary provides a quick sketch of the plan and its intended function.

Sample Hazard Mitigation Plan Adoption Resolution
(Resolution No. __)

Whereas (insert community name), Michigan has experienced repetitive disasters that have damaged commercial, residential and public properties, displaced citizens and businesses, closed streets and bridges dividing the community both physically and emotionally, and presented general public health and safety concerns; and

Whereas the community has prepared a *Hazard Mitigation Plan* that outlines the community's options to reduce overall damage and impact from natural and technological hazards; and

Whereas the *Hazard Mitigation Plan* has been reviewed by community residents, business owners, and federal, state and local agencies, and has been revised to reflect their concerns;

Now, therefore, be it resolved that:

1. The *Hazard Mitigation Plan* is hereby adopted as an official plan of the (insert community name).
2. A hazard mitigation planning group is hereby established as a permanent community advisory body. The (insert name of position) shall designate its members, subject to the approval of (insert community governing body). They shall serve one-year terms. The group's duties shall be as designated in the *Hazard Mitigation Plan*.
3. The (insert name of position) is charged with supervising the implementation of the Plan's recommendations within the funding limitations as provided by the (insert community governing body) or other sources.
4. The (insert name of position) shall give priority attention to the following action items recommended by the *Hazard Mitigation Plan*:
    a. _____ (Recommendation _____, page ___)
    b. _____ (Recommendation _____, page ___)
    c. _____ (Recommendation _____, page ___)
    d. _____ (Recommendation _____, page ___)
    e. _____ (Recommendation _____, page ___)
5. The (insert name of position) shall convene the hazard mitigation planning group quarterly. The planning group shall monitor implementation of the plan and shall submit a written progress report to (insert community governing body) in accordance with the following format:
    a. A review of the original plan.
    b. A review of any disasters or emergencies that occurred during the previous calendar year.
    c. A review of the actions taken, including what was accomplished during the previous year.
    d. A discussion of any implementation problems.
    e. Recommendations for new projects or revised action items. Such recommendations shall be subject to approval by this (insert community governing body).

Passed this ____ day of (date).

NOTE: A CERTIFIED COPY OF THE RESOLUTION OF ADOPTION <u>MUST</u> BE INCLUDED WITH COPIES OF A PLAN THAT IS BEING SUBMITTED TO STATE AND FEDERAL AGENCIES FOR APPROVAL (to comply with the requirements of the Disaster Mitigation Act of 2000).

Sample Hazard Mitigation Plan

Purpose

The (insert community name) Hazard Mitigation Plan was created to protect the health, safety, and economic interests of residents by reducing the impacts of natural and technological hazards through hazard mitigation planning, awareness, and implementation. Hazard mitigation is any action taken to permanently eliminate or reduce the long-term risk to human life and property from natural and technological hazards. It is an essential element of emergency management along with preparedness, response and recovery. This plan serves as the foundation for hazard mitigation activities within the community. Implementation of the plan's recommendations will reduce injuries, loss of life, and destruction of property due to natural and technological hazards. The plan provides a path toward continuous, proactive reduction of vulnerability to the most frequent hazards which result in repetitive and often severe social, economic and physical damage. The ideal end-state is total integration of hazard mitigation activities, programs, capabilities and actions into normal, day-to-day governmental functions and management practices.

Planning Process

The (insert community name) Hazard Mitigation Plan examines multi-hazard mitigation activities and opportunities. Emphasis is placed on hazards which have had significant impact on the community in the past. The planning process followed in the development of the (insert community name) Hazard Mitigation Plan consisted of the following steps:

1) Identification of hazards and risks.
2) Identification and definition of goals and objectives.
3) Identification of alternatives for solving problems.
4) Selection of evaluation criteria.
5) Selection of alternatives (feasible mitigation strategies).
6) Preparation of a draft plan.
7) Preparation of the final plan.
8) Implementation of the plan.
9) Monitoring and periodic revision of the plan.

NOTE: This is merely a suggested framework (following the steps described throughout this workbook). Your plan should include a substantive description of the planning process that it used to research and analyze hazards, obtain public input, develop a draft plan, incorporate suggestions and feedback into the plan, adopt the completed plan, and to monitor plan implementation, periodic review and revision in forthcoming years.

Identification of Hazards and Risks

The community's hazard analysis, dated (insert date) lists the following natural and technological hazards, ranked in order of potential severity of impact on the community: **(Please refer to Steps 1c and 1d in the main body of this workbook for more details about this type of table and how it will be filled out.)**

Hazard Ranking: (name of community)
(year)

HAZARD	How Frequently has the Hazard Occurred in the Past?	How Likely is the Hazard to Occur in the Future?	Potential Geographic Size of the Affected Area	Population Impact Potential Population Impacted	Significance of Impact (Population, Economic, Environment, etc.)	Ranking (Priority of this hazard for mitigation activities)
Civil Disturbances **FOR EXAMPLE:**	**Once every 5 years**	**About every 5 years**	**Several small sites**	**Up to 3,000 persons**	**Assessed hazard rating: 2.2**	**15th**
Drought						
Earthquakes						
Extreme Temperatures						
Fire Hazards: Scrap Tire Fires						
Fire Hazards: Structural Fires						
Fire Hazards: Wildfires						
Flood Hazards: Dam Failures						
Flood Hazards: Riverine/Urban Flooding						
Flood Hazards: Shoreline Flooding/Erosion						
Hazardous Material Incidents: Fixed Site						
Hazardous Material Incidents: Transportation						
Infrastructure Failures						
Nuclear Attack						
Nuclear Power Plant Accidents						
Oil and Gas Well Accidents						

HAZARD	How Frequently has the Hazard Occurred in the Past?	How Likely is the Hazard to Occur in the Future?	Potential Geographic Size of the Affected Area	Population Impact Potential Population Impacted	Significance of Impact (Population, Economic, Environment, etc.)	Ranking (Priority of this hazard for mitigation activities)
Petroleum and Natural Gas Pipeline Accidents						
Public Health Emergencies						
Sabotage & Terrorism						
Subsidence						
Thunderstorm Hazards: Hailstorms						
Thunderstorm Hazards: Lightning						
Thunderstorm Hazards: Severe Winds						
Thunderstorm Hazards: Tornadoes						
Transportation Accidents: Air, Land and Water						
Severe Winter Weather Hazards: Ice/Sleet Storms						
Severe Winter Weather Hazards: Snowstorms						
Other hazards: (list)						
Other hazards: (list)						

The analysis reveals that (insert top hazard here) is the most problematic hazard for (name of community), followed in order by (list next 8-10 hazards from analysis). Accordingly, this plan focused on those hazards in developing needed mitigation measures for the community.

Hazard Mitigation Goals and Objectives

The mission of the (insert community name) Hazard Mitigation Plan is to protect the health and safety of the public and property of the community by taking action to permanently eliminate or reduce the long-term risk to human life and property from natural and technological hazards.

In order to accomplish that mission, specific goals and objectives have been established. These goals and objectives are based on the community's hazard analysis, as well as input from the public, home and business owners, community organizations, and other interested entities.

NOTE: Actual examples of mitigation strategies and implementable action steps can be found starting on page 107. The following examples are merely of <u>broad</u> goals and objectives, and would not in themselves constitute an approvable action plan.

Goals and Objectives for (insert year)

Goal 1: Increase local participation in hazard mitigation.

A. Encourage cooperation and communication between urban planning and emergency management officials.
B. Encourage local agencies to participate in the hazard mitigation process.
C. Encourage public and private organization participation.

Goal 2: Integrate hazard mitigation considerations into the community's comprehensive planning process.

A. Incorporate hazard provisions in building code standards, ordinances, and procedures.
B. Incorporate hazard mitigation into the basic land use regulation mechanisms.
C. Update of zoning ordinances to reflect new building code and shoreline protection rules.
D. Develop code enforcement and zoning ordinances in urban/wildland intermix areas.
E. Incorporate hazard area classifications into standard zoning classifications.
F. Adopt urban forest management plans or ordinances.
G. Develop community warning systems.
H. Strengthen anchoring requirements for propane tanks and hazardous material tanks in the floodplain/floodway.
I. Strengthen the role of the Local Emergency Planning Committee in the land development process.
J. Integrate hazard mitigation into the capital improvement planning process so that public infrastructure does not lead to development in hazard areas.
K. Integrate hazard mitigation into the community's planning enabling legislation.

Goal 3: Apply available resources to hazard mitigation.

A Provide a list of desired community mitigation measures to the State for possible future funding.
B. Encourage the Road Commission to review local roads, bridges, and related transportation infrastructure for hazard vulnerability.
C. Encourage private business involvement in hazard mitigation projects.

Goal 4: Increase public awareness of hazard mitigation.

A. Increase awareness of hazard provisions in building code standards, ordinances, and procedures.
B. Increase awareness of the National Flood Insurance Program.

Goal 5: Complete all hazard mitigation projects as scheduled. (List projects as objectives.)

A. Floodproof City Hall (HMGP project #1226.30)
B. Install interior sprinkler system in community center.
C. Relocate DPW gasoline tank outside of the floodplain.
Etc.

Mitigation goals must be integrated with other community goals to be fully effective. Hazard mitigation has a much greater likelihood for success when mitigation goals are effectively combined with other community goals. Combining community goals in such a way places the community in a "win-win" situation where everyone benefits. Mitigation goals can often "tip the scale" of community values enough to ensure that everyone's goals are met

Identification of Alternatives for Solving Problems

The (name of community) used a variety of sources in developing a range of potential solutions for solving identified problems associated with the various hazards addressed in this plan.

First, a series of "brainstorming" sessions were held on (list dates) to solicit ideas and suggestions from local public officials, citizens, home and business owners, community organizations, the regional planning commission, and state and federal government. At these meetings, literally hundreds of suggestions were made on possible ways to reduce or eliminate community vulnerability to natural and technological hazards. Those suggestions were grouped by hazard type. Then, a screening committee comprised of (describe membership of selection committee) went through the ideas and suggestions and filtered out those that were not compatible

with the community's goals and objectives, or were not technically or financially feasible. Through this screening process, only those alternatives that had a viable chance of being implemented were actually considered.

Evaluation Criteria Used to Select and Prioritize Alternatives:

Next, a set of evaluation criteria was developed in order to determine which of the mitigation alternatives were best suited to address the identified problems within the current framework of mitigation programs and policies within the community. The following evaluation criteria were used to select and prioritize alternatives for this plan:

Evaluation Criteria

- The cost of the measure must be less than the cost of repetitive repairs that would be necessary if the measure was not implemented.
- The measure must be acceptable to those participating and/or primarily impacted.
- The measure must be affordable to all it affects, and not discriminate against those who are unable to bear the cost.
- The measure must not result in an inequitable distribution of essential public services.
- The measure must be environmentally sound and not cause any permanent, significant environmental concerns.

Common mitigation criteria stipulate that selected measures be economically justifiable, technically feasible, socially equitable, and environmentally sound. Other criteria could include 1) measures that provide benefit to the greatest number of residents and structures, 2) measures that can be implemented using local resources only, 3) measures providing the greatest protection to public facilities, and 4) measures that support one or more elements of the community's Comprehensive Plan.

Selection of Alternatives (Feasible Mitigation Strategies)

Community decision-makers then reviewed the list of alternatives against the established evaluation criteria to come up with the list of the most desired alternatives for each community goal. The selected alternatives are presented in the following section.

Recommended Mitigation Actions

The following recommended actions are selected for the goals and objectives that were presented earlier. Each recommended action is addressed similarly and includes the following analysis components:

- Description of the problem
- Description of the action
- Lead manager assigned
- Schedule to initiate action
- Potential sources of technical assistance
- Potential sources of financial assistance
- Priority of mitigation actions **(NOTE: This is <u>important</u> but was not included in the examples below!)**

<u>The following examples are from the Flood Mitigation Assistance Plan of the City of Vassar, Michigan:</u>

1. Reduce flood losses to the fullest extent possible

1.1. *Reduce losses associated with Cass River flooding*

<u>1.1.1. Establish an ongoing floodway acquisition and land re-use program. Rezone floodway to reflect current uses and update to reflect additional open space as it becomes available:</u>

Description of the problem: The floodway is the most dangerous portion of the floodplain. It is the area intended to carry the majority of the fast-moving floodwaters. The floodway is intended to carry the entire 100-year flood without increasing that flood height by more than 1/10 of a foot. The floodway has the most stringent development and building regulations within the floodplain. Because it is a dangerous location for a building, and because codes make it difficult to repair, expand, or replace existing structures, all efforts should be made to clear the floodway of obstructions and maintain it in an "open" state. This will also clear the property adjacent to the river so that it can be reused as a contiguous riverfront recreation area.

Description of the Action: Establish a voluntary acquisition program of floodway properties based on Fair Market Value. Retain in public ownership and rezone as a conservation area.

Lead Manager Assigned: City Manager, City appointed "Board," or hire an experienced Mitigation Program Manager to manage the entire plan implementation effort. Include that cost in the various grant proposals.

Schedule to Initiate Action: Initiate grant applications by Oct. 1, 1998, and resubmit following every Presidential Disaster Declaration within the state of Michigan.

Potential Sources of Technical Assistance: State Hazard Mitigation Program, State NFIP Program, Michigan Stormwater-Floodplain Association.

Potential Sources of Financial Assistance: FMA, HMGP, CDBG, Clean Michigan Initiative, and USACE Challenge 21 program.

1.1.2. Establish an ongoing floodplain property protection program ("floodproofing"):

Description of the problem: The floodplain building inventory identifies structures that are prone to a variety of flood depths. In certain instances, the most cost-effective method of protecting buildings can be through "floodproofing" rather than acquisition and/or relocation.

Description of the Action: Establish a floodproofing program to protect appropriate structures within the floodplain.

Lead Manager Assigned: City Manager, City appointed "Board," or hire an experienced Mitigation Program Manager to manage the entire plan implementation effort. Include that cost in the various grant proposals.

Schedule to Initiate Action: Initiate grant applications by December 1, 1998, and resubmit following every Presidential Disaster Declaration within the state of Michigan.

Potential Sources of Technical Assistance: State Hazard Mitigation Program, State NFIP Program, Michigan Stormwater-Floodplain Association.

Potential Sources of Financial Assistance: FMA, HMGP, CDBG, Clean Michigan Initiative, USACE Challenge 21 program, and Homeowner contribution.

1.1.3. Revise current Floodplain Management Ordinance:

Description of the problem: The existing floodplain management ordinance for Vassar needs updating to include current standards for "Substantial Damage and Improvement." Consideration should also be given to including language regarding repetitive losses and the availability of "Increased Cost of Compliance" (ICC) insurance. The first changes are required as a minimum condition of participation within the NFIP. The second change may provide financial relief to insured and repetitively flooded property owners, but may also prove to be more of a burden than it's worth because it could require some property owners to elevate their properties when they are not eligible for an ICC payment.

Description of the Action: Review the "model" ordinances provided to the City, decide upon appropriate changes, and proceed to make the formal changes and adjustments.

Lead Manager Assigned: City Manager

Schedule to Initiate Action: Within 90 days of plan adoption.

Potential Sources of Technical Assistance: State NFIP Program manager

Potential Sources of Financial Assistance: None necessary.

1.1.4. Establish a post-flood temporary moratorium on repair of floodway and repetitive flood-loss buildings;

Description of the problem: In order to facilitate recommendation #1.1.1 (floodway acquisition program), Vassar should take actions that would facilitate the removal of floodway (and repetitively flooded) structures rather than their repair. A post-flood temporary moratorium allows for time to conduct a detailed damage assessment of the structure and for coordination with the building owner, so that repair funds could be used to purchase the structure rather than to subject it to flooding again.

In the case of non-floodway repetitive-loss buildings, other loss-reduction techniques may be feasible. However, as a requirement for CRS (see the next recommendation), Vassar *must* have a formal plan to mitigate losses to structures that are repetitively flooded. There are 10 such properties in Vassar.

Description of the Action: Adopt an ordinance, or revise the City Code, so that a Temporary Moratorium on permits to repair certain floodprone properties is automatically triggered with a local "Declaration of an Emergency." If the damage assessment reveals that damage is minimal or non-existent, and/or that the moratorium is unwarranted under existing conditions, it may be suspended by City Council.

Establish as the second priority (after acquisition of floodway properties) a program of mitigation activities for the repetitively flooded structures.

Lead Manager Assigned: City Manager

Schedule to Initiate Action: Within 60 days of plan adoption.

Potential Sources of Technical Assistance: State NFIP Program, State Division of Emergency Management, Model Moratorium provided by planning consultants.

Potential Sources of Financial Assistance: None necessary.

1.1.5. Join the Community Rating System to reduce the cost of flood insurance;

Description of the problem: CRS is a program that reduces the cost of flood insurance premiums in communities that implement flood loss reduction activities that exceed the minimum standards of the NFIP. Credit is given for these actions because it has been demonstrated that they result in reduced flood losses. Vassar already undertakes several activities "worth credit" (0.1 floodway rise, BFE +1, warning system, previous acquisition) and will undertake more with the implementation of this plan (including adopting this plan!)

Description of the Action: Fill out the CRS application forms and submit.

Lead Manager Assigned: City Manager or staff; or a committee of insured property owners (since they reap the benefit of lower insurance costs); or regional planning council.

Schedule to Initiate Action: Submit application within 6 months of plan adoption.

Potential Sources of Technical Assistance: State NFIP Program, Michigan Stormwater-Floodplain Association, Regional Planning Council, Insurance Services Organization (ISO).

Potential Sources of Financial Assistance: None necessary, but application process is time-consuming.

1.1.6. Model the effects of removing/raising each bridge crossing the Cass to determine the impact of those actions on reducing flood levels. Model removing the "islands," the old M-15 bridge deck, and "lowering" the Cass through dredging.

Description of the problem: Many people within the community believe that floods are exacerbated by constrictions to the flow of floodwaters, such as the bridges, the "islands" of sediment downstream of where the Moore Drain meets the Cass River.

Due to this discussion, a CPT member from the Land and Water Division of DEQ has already addressed the impacts of removing the old dam, the downstream RR bridge, removing the "islands," and "lowering" the Cass River through dredging. The proposed actions had little effect (lowers the 100-year flood elevation 0.4 foot by removing dam *and* dredging Cass 3 feet; lowers it 0.4 feet by removing the downstream RR bridge; and lowers it 0.1 foot by removing the "islands."). (0.1 foot = 1.2 inches; 0.4 foot = 4.8 inches) The analysis is included as Appendix 6.

This recommendation is to complete this effort by modeling the removal of the upstream railroad and M-15 bridges to determine if either of those projects would have a beneficial impact by significantly lowering expected flood heights.

Description of the Action: Request DEQ/Land and Water Division to undertake this analysis.

Lead Manager Assigned: City Manager (Or Establish an "Implementation Committee" among Vassar CPT members and have them initiate the action)

Schedule to Initiate Action: Submit a written request within 30-days of plan adoption.

Potential Sources of Technical Assistance: DEQ/Land and Water Division

Potential Sources of Financial Assistance: Probably none necessary for modeling on the Cass River because data already exists. If requested to model different scenarios for the Moore Drain (see recommendation 1.2.1[Option A]), funding will likely be required to generate data that the DEQ does not already have. Request that the state Division of Emergency Management provide funding to DEQ under the Technical Assistance provisions of the FMA program.

1.2.*Reduce losses associated with Moore Drain flooding*

Upstream (left) and downstream (right) views of Moore Drain from north side of Huron Street

1.2.1.a Determine, through hydrological analysis, the effect of relocating the Moore Drain on downtown flooding (Option A). Compare the effects of several different relocations to enlarging, dredging, "opening up" existing location in conjunction with examining upstream retention structure(s) (Option B). Analysis of both options should include the feasibility and hydraulic effects of one or more strategically placed retention ponds within the drain system, redesigning how the drain enters the Cass, and installing a back-flow prevention system (with pump) where the drain enters the Cass.

(A) If relocation of the drain is most effective in reducing "nuisance flooding", proceed with analysis of "best" location (most cost-effective, least path of resistance), determine "beneficiaries" and proceed towards construction. If the drain is relocated, then the existing drain channel should be retained for stormwater purposes, but be enclosed in pipe;

(B) If relocation of drain is not effective, proceed with Option B (enlarge, improve existing drain);

In either case, if the analyses demonstrate the retention ponds or back-flow prevention systems as effective, they should also be included in the construction plans.

Description of the problem: The Moore Drain contributes significantly to the flooding problems of Vassar. When the Cass River is at or above flood stage, the Moore Drain does not empty into the Cass, but rather "backs up" causing flooding along its banks, and in the downtown business district. In events where significant rainfall occurs, but not in conjunction with high water along the Cass River, the Moore Drain can also overflow due to its inadequate capacity. The Moore Drain has been a known source of flooding problems for decades, yet no action has occurred. In 1997, a "Board of Determination" authorized corrective work on the drain to be accomplished. That work should be initiated.

Description of the Action: Undertake an engineering analysis to determine the best solution and then implement that solution.

Lead Manager Assigned: Tuscola County Drain Commissioner

Schedule to Initiate Action: Within 30 days of plan adoption. Determine cost of engineering analysis (check with state agencies). Determine beneficiaries and assess the fees. Consider using fees as "match money" for grants that may support the engineering analysis and the implementation of the solution.

Potential Sources of Technical Assistance: DEQ/Land and Water Management Division

Potential Sources of Financial Assistance: Assessed fees, FMA, HMGP, CDBG, USACE, Natural Resource Conservation Service (NRCS).

1.2.1.b If the Moore Drain cannot be relocated, for whatever reason, then Vassar should submit a request to MDOT to raise M-15 (Huron Street), eastward from Main Street, to eliminate the frequent closing of the M-15 bridge across the Cass River.

Description of the problem: When the Moore Drain floods it often inundates Huron Street (M-15) and eliminates access to the M-15 bridge. This divides the community in two, creating significant public safety, economic and social impacts. If frequent downtown flooding caused by the overflow or back-up of the Moore Drain cannot be eliminated by relocating the drain and enclosing the existing drain channel in pipe, then raising M-15 to "tie into" Main Street (or the higher reaches of Huron Street) would rectify the problem of Vassar being split into two isolated areas, though it would not reduce flood losses to the downtown buildings.

Description of the Action: Request MDOT to raise M-15, *only if* Moore Drain flooding cannot be resolved through channel relocation or other improvements.

Lead Manager Assigned: Vassar City Council

Schedule to Initiate Action: 30 days following the failure of recommendation 1.2.1.a.

Potential Sources of Technical Assistance: MDOT, DEQ/Land & Water Management Division

Potential Sources of Financial Assistance: MDOT, FHwA, HMGP, CDBG, and Assessed fees.

1.2.2. Implement an annual "clean-up" program along the Drain while study (from recommendation 1.2.1.a) is being developed.

Description of the problem: Regardless of the outcome of the above analysis, or the length of time it takes to fund and complete it, efforts should be taken to maintain the existing channel to ensure its peak performance until existing shortfalls are corrected. A common practice is to have "clean up" days, when trash, limbs, barrels, shopping carts, and other potential blockages are removed from the drainageway culverts, channel and adjacent land.

Description of the Action: Establish an annual or semi-annual "clean-up" program.

Lead Manager Assigned: Tuscola County Drain Commissioner

Schedule to Initiate Action: Initiate first clean-up in early spring of 1999.

Potential Sources of Technical Assistance: None necessary.

Potential Sources of Financial Assistance: None necessary. Use volunteers, scout troops, teenage groups, jail inmates, National Guard, Americorps, etc.

1.2.3. Enforce existing Drain easement regulations, up and downstream.

Description of the problem: The Michigan Drain Code requires a "set-back" from the actual Moore Drain channel. Reports indicate that it is not enforced, either in town or upstream along agricultural properties. Failing to maintain the set-back along agricultural properties makes it "easier" for wind and water-borne sediments to get into the drainage canal, which in turn, decreases its capacity to carry water. Sediment, yard clippings, branches and illegal dumping occurs along the sides of the drain within town, which also reduces the carrying capacity of the drain. Since the drain no longer carries its designed capacity of water, beneficiaries from this effort are both agricultural and town "users" of the drain.

Description of the Action: Enforce existing regulations, and examine existing enforcement mechanisms if they prove to be insufficient.

Lead Manager Assigned: Tuscola County Drain Commissioner

Schedule to Initiate Action: Identify potential violations within 30 days of plan adoption. Send notification to property owners within 60 days, and follow-up to verify corrective actions within 120 days. Initiate existing enforcement mechanisms after 120 days. Follow-up on inspections and enforcement.

Potential Sources of Technical Assistance: None necessary

Potential Sources of Financial Assistance: None necessary. Use Drain Commission operating expenses and/or assess violators for costs of corrective action.

1.3 *Improve ability to respond to & recover from flooding events*

1.3.1 Coordinate with American Red Cross to ensure adequate designated emergency shelters.

Description of the problem: The flood recovery exercise revealed that buildings commonly used as emergency shelters during flooding and other community disasters have not been inspected and certified as adequate facilities by the American Red Cross (ARC), which manages the facilities when operating as shelters. This is required in order for certain associated expenses to be reimbursable and for some liability considerations

Description of the Action: Coordinate with the ARC and building owners to facilitate the necessary inspections. Should any inadequacies be identified, be prepared to either make the required repairs and/or alterations, or identify more suitable shelter space.

Lead Manager Assigned: City Manager should request ARC to initiate the required "shelter survey" and facilitate the inspections between property owners and the ARC.

Schedule to Initiate Action: Initiate request to ARC within 60 days of Plan Adoption. Follow-up as necessary.

Potential Sources of Technical Assistance: Tuscola County ARC chapter, State Division of Emergency Management, FEMA Region V (Chicago).

Potential Sources of Financial Assistance: None necessary to start.

1.3.2 Develop a written Flood Response and Recovery Plan

Description of the problem: This is more a need to formalize existing procedures than a new activity. The Public Works department already has a set of activities that it undertakes when water levels reach certain heights on the Huron Street gage. Among the emergency activities planned is the protection of critical facilities, such as maintaining the availability of water by protecting the city well-house(s) and pump stations (usually with sandbags or other barriers).

Flood stage gage on M-15 (Huron Street) Bridge

Description of the Action: Incorporate this (and other) activity (ies) into a written and annually exercised Flood Response and Recovery Plan. Identify who takes what action at what river stage, and what equipment and materials are necessary to carry out the job.

Lead Manager Assigned: Public Works Director.

Schedule to Initiate Action: Initiate Flood Response & Recovery Planning process within 90 days of plan adoption. Include those people that will have a responsibility in carrying out the recommended actions in the planning process.

Potential Sources of Technical Assistance: State Division of Emergency Management, USACE (Sandbagging advice and demonstrations), Tuscola County Emergency Manager, Flood Mitigation specialists.

Potential Sources of Financial Assistance: None necessary

1.3.3 Maintain DPW as "EOC" – consider permanent relocation of Police Department to a flood-free location

Description of the problem: The city needs a pre-designated location from which to manage and conduct emergency operations. Since the community is small, and most staff will be responding to events and communicating by radio, the Emergency Operations Center, or "EOC," does not have to be extremely large or "high tech." However, it should be flood free so that operations may continue without disruption. The Public Works building is currently designated as the EOC, and it should remain so. It is sited in a flood-free location and the Department of Public Works plays a vital role in the response to flooding events. However, the Police Department headquarters, in the basement of City Hall, is subject to flooding. Since the Police Department also plays a vital role in the response to flooding events, serious consideration should be given to its permanent relocation.

Description of the Action: Officially designate the Public Works building as the EOC. Maintain the EOC with a minimal level of necessary equipment (a "white board" and markers, a sufficient number of phone lines, a copier, a fax machine, a computer, 2 or 3 polaroid or disposable cameras, damage assessment forms, building placards, hand-held radios that are compatible with police, fire, and city management, and basic supplies such as tape, markers, hard hats, barricades, first-aid kits).

Lead Manager Assigned: Public Works Director

Schedule to Initiate Action: Initiate acquisition of supplies as soon as possible. Continue in an on-going manner until adequate supplies can be purchased or obtained through public-private-non-profit partnerships

Potential Sources of Technical Assistance: State Division of Emergency Management, State Surplus Supply, and Tuscola County Emergency Manager.

Potential Sources of Financial Assistance: Normal departmental operating budgets, surplus supplies, and donations.

1.3.4. Establish Memoranda of Understanding, or "MOU's," for damage assessment and post-flood permitting with neighboring non-floodprone communities.

Description of the problem: The flood recovery exercise revealed that, following a major flood, it would be difficult to adequately inspect, placard, and issue permits for repairs to buildings due to the number of buildings affected and the small number of trained staff in Vassar. Establishing "MOU's" with neighboring, non-floodprone communities will ensure that Vassar has sufficient access to qualified, available building officials when warranted. It also sets up the framework for reimbursement should federal disaster assistance be made available.

Description of the Action: Establish "MOU's" for damage assessment and permitting support in a post-disaster scenario.

Lead Manager Assigned: City Manager, Tuscola County Building Official and Tuscola County Emergency Manager

Schedule to Initiate Action: Initiate MOU's within 90 days of plan approval.

Potential Sources of Technical Assistance: State Division of Emergency Management, Tuscola County Building Official, and Tuscola County Emergency Manager.

Potential Sources of Financial Assistance: None necessary.

1.3.5. Provide training for conducting Damage Assessments and determining "Substantial Damage;"

Description of the problem: An essential element of post-flood hazard mitigation relies heavily upon an efficient and accurate assessment of building damages. City staff should be trained in the conduct of detailed Damage Assessments (and other emergency management techniques, e.g., post-disaster record-keeping, EOC management, media management, etc.)

Description of the Action: Enroll city officials for training courses that cover the responsibilities they will be assigned in a post-flood scenario. These courses are offered frequently, free of charge, in Michigan, at conferences and FEMA's training institutes.

Lead Manager Assigned: Tuscola County Emergency Management.

Schedule to Initiate Action: Identify appropriate courses and their scheduled offerings, and coordinate the participation of Vassar officials. Initiate applications as courses become available.

Potential Sources of Technical Assistance: State Division of Emergency Management, FEMA Region V, ARC, and Tuscola County Emergency Management.

Potential Sources of Financial Assistance: None necessary. Courses are usually offered within the close-by area. FEMA "resident courses" are completely reimbursable except for meals and salary

1.3.6. Obtain a "GIS" system to support pre-flood planning, response activities, and post-flood recovery activities

Description of the problem: Effective management of disasters, and day-to-day floodplain management, require an in-depth understanding of the changing circumstances, as well as a method of maintaining and "tracking" critical building information --- such as that contained within the Building Inventory. Geographic Information Systems, or "GIS," display computerized layers of mapped data, enabling accurate management of floodprone buildings (e.g., percent of damage, number of incidents, floodplain location, insurance payments, assessed values, depth of flooding, land-use versus zoning designations, repair permits issued, etc.). The same principles can be applied for disaster recovery purposes (degree of damage, utility support, occupancy, etc.) Together, this data can be utilized to support response needs (evacuation, traffic routing, shelter management, 911 calls), detailed damage assessments, identifying mitigation projects, establishing environmental baselines, and monitoring changes in land-use.

Description of the Action: Initiate grant application for a stand-alone GIS workstation. Determine available data formats and existing systems of other users (state offices) to ensure compatibility *before* purchasing.

Lead Manager Assigned: City Manager. Include in Operating Budget request, or identify and submit an appropriate grant application.

Schedule to Initiate Action: Initiate grant application within 90 days of Plan Adoption.

Potential Sources of Technical Assistance: State Hazard Mitigation Program, USACE, State NFIP Program, Michigan Stormwater-Floodplain Association.

Potential Sources of Financial Assistance: USACE-Detroit District

1.3.7. Consider requirements for establishing a "Fill Your Basement with Water" Order

Description of the problem: Flooded buildings are often damaged by hydrostatic pressure, created by unequal pressure on building walls. This is created when buildings have water tight, or near watertight basements. It is often aggravated when building owners pump floodwaters out of flooded buildings when the water outside the

building (or the saturated soil) still exerts extreme pressures on building walls. Filling a basement with clean water can prevent serious structural damage by equalizing the pressures and facilitates cleanup because there is clean water, not silt and sewage-laden muddy water in the structure. NFIP policies will pay for damage incurred by policyholders when this is done because the damages are less than they would be otherwise. However, this policy feature is only available when (a) there is an official "Flood Warning" issued by the appropriate National Weather Service office, and (b) a local official (City Manager, County Emergency Manager) has "ordered" property owners to fill their basements. (Of course, you must also have an NFIP policy in force!)

Description of the Action: Coordinate with State NFIP Coordinator and FEMA Region V to determine the exact conditions and requirements where such a policy would benefit both the policyholders and the NFIP. No official public action would be necessary prior to enactment of this policy, but pre-planned public information would be critical to maximize the effectiveness of this action.

Lead Manager Assigned: City Manager in coordination with Michigan NFIP Coordinator.

Schedule to Initiate Action: Initiate discussion with State NFIP Coordinator within 6 months unless a flood is imminent. In that case, make contact immediately.

Potential Sources of Technical Assistance: State NFIP Program, Michigan Stormwater-Floodplain Association, FEMA Region V.

Potential Sources of Financial Assistance: None necessary.

1.3.8. Consider establishing a secure "Community Storage" area for temporary flood-free storage of personal property

Description of the problem: A major source of flood losses results from damaged personal property. In cases where adequate "lead-time" can be provided prior to a flood event, people have reduced their exposure to flood losses by moving their possessions to higher ground (either upstairs in the same building, or to another building in a flood-free location).

Description of the Action: Consider establishing a "Community Storage" area. In addition to securing the use of an appropriate building (Ivan Middleton Hall was suggested), security needs to be provided to protect each person's belongings. The City can consider paying for this service, or making it available through a "user's fee" or volunteer organization.

Lead Manager Assigned: City Manager can make the proposal to City Council. If City Council agrees to implement this action, it can be implemented by any City department, (Police, Public Works) or a citizen or church organization.

Schedule to Initiate Action: Initiate discussion within 6 months.

Potential Sources of Technical Assistance: Contact the Office of Community Development, City of Frankfort, Kentucky to learn about their similar program.

Potential Sources of Financial Assistance: None necessary to establish. Some costs may apply to the use of the building and for providing security. City or "User's Fees.

1.3.9. Obtain an adequate number of barricades to close roads when necessary

Description of the problem: City staff has a plan of what to do and when to do it when waters rise. These actions include closing roads and bridge access in order to keep people from harm's way. However, there often are not enough barricades to accomplish the job, forcing the staff to utilize whatever materials are readily available. This has resulted in road closures that utilize couches and other "non-official" materials to establish barricades. This promotes sightseers circumventing what should be official closures. The City should have an

adequate supply of barricades available on a permanent basis. Rental contracts are a possibility, but do not guarantee their availability when they are needed.

Description of the Action: Determine how many barricades are necessary for floods of various elevations, and obtain an adequate supply.

Lead Manager Assigned: Public Works Director.

Schedule to Initiate Action: Within 60 days of plan adoption.

Potential Sources of Technical Assistance: None necessary.

Potential Sources of Financial Assistance: Public Works Operating Budget.

1.3.10 Develop a written multi-hazard warning plan

Description of the problem: Currently, Vassar utilizes a warning plan that was developed as part of a flood-exercise for community officials. While city department directors know what actions to take at certain river levels as indicated on the M-15 bridge gage, there is no overall process to coordinate all of the actions being taken, or for early public notification. Early public notice can provide "lead time" which can prevent losses. One area worthy of consideration would be using the public siren for flood warnings (in addition to its current use for tornadoes).

Siren on top of Vassar City Hall

Description of the Action: As part of the written Response and Recovery Plan (Recommendation 1.3.2) include a section detailing the flood warning process. Consider using the siren in coordination with a public education effort (Recommendation 4.1.1) to inform citizens those conditions under which the siren would be utilized, and where to find additional, official, event-specific information.

Lead Manager Assigned: City Manager

Schedule to Initiate Action: Within 90 days of plan adoption.

Potential Sources of Technical Assistance: Tuscola County Emergency Management, Michigan Stormwater-Floodplain Association, National Weather Service, FEMA Region V, and USACE.

Potential Sources of Financial Assistance: Very little necessary. Grant applications can fund the Public Education components.

1.3.11. Establish and enforce strict penalties for "No Entry" areas

Description of the problem: In past floods, local authorities have had to divert resources from other high-priority response activities in order to respond to activities that occur as a result of people ignoring posted "no entry" signs (e.g., cars getting stuck in high water, "sightseers" trespassing on private, evacuated property). Establishing, publicizing and enforcing strict penalties for those that violate these temporary "No Entry" zones should deter future violations, and allow city officials to focus on more critical tasks.

Description of the Action: City Council should adopt an array of post-disaster, emergency, temporary, ordinances ("no-entry" zones, anti-price gouging, curfew, suspension of sales of liquor and firearms, waiver of mobile-home restrictions, etc.). These can be established so that they are automatically "activated" upon declaration of a Local Emergency (a legal action that is required for emergency authority, expenditure of contingency funds and requesting supplemental assistance from the county, state and federal governments.) In addition, develop and issue "Resident/Business Owner Stickers" so those with an immediate need to be on-site can easily be identified and provided access.

Lead Manager Assigned: Police Chief in coordination with Tuscola County Emergency Manager.

Schedule to Initiate Action: Initiate within 90 days of plan adoption.

Potential Sources of Technical Assistance: State Hazard Mitigation Program, State NFIP Program, Michigan Stormwater-Floodplain Association, FEMA Region V, American Red Cross, USACE-Detroit District.

Potential Sources of Financial Assistance: Minimal amount necessary for ID stickers. Could be sold at cost.

1.3.12. Stockpile ARC, FEMA, USACE and other damage prevention, and post-flood repair and cleanup publications

Description of the problem: There are many pre- and post-flood publications available that focus on reducing property damage. Most provide self-help guidance for property owners, and others include engineering design details for measures requiring construction.

Description of the Action: The City should identify, order and stockpile at least 100 copies of each appropriate publication for post-flood distribution. Public notice should be made, through the Public Education component of this plan, to alert property owners to their pre-flood availability. Additionally, having these publications available to the public is a creditable activity under the Community Rating System (See Recommendation 1.1.5).

Lead Manager Assigned: District Library

Schedule to Initiate Action: Initiate within 30 days of plan adoption.

Potential Sources of Technical Assistance: State Hazard Mitigation Program, State NFIP Program, Michigan Stormwater-Floodplain Association, FEMA Region V, American Red Cross, USACE-Detroit District.

Potential Sources of Financial Assistance: None necessary.

1.3.13 Create a list of Recovery "Vendors"

Description of the problem: Following floods and other disasters there is often a need for typical and specialized goods and services that exceed those available locally (e.g., cleaning, drying, pumps, repairs, construction supplies, portable refrigeration units, disaster recovery experts.) Having quick and ready access to appropriate vendors, particularly when flooding conditions are widespread, can facilitate a more rapid recovery and reduce continuing post-flood losses.

Description of the Action: Establish a list of local and Michigan-based vendors and disaster recovery specialists to support disaster recovery efforts.

Lead Manager Assigned: City Manager in coordination with Tuscola County Emergency Manager.

Schedule to Initiate Action: Initiate within 90 days of plan adoption.

Potential Sources of Technical Assistance: Local and regional Chambers of Commerce, regional contractor's association, Michigan Stormwater-Floodplain Association.

Potential Sources of Financial Assistance: None necessary.

More examples: (sample mitigation strategies for other hazards)

NOTE: The examples that follow are not from an actual community's plan.

2. Reduce the adverse effects of periodic drought events

Description of the problem: A hazard analysis has revealed that Example County suffers from serious drought events approximately every twenty years, causing extensive agricultural damage, and significant increases in the number of serious wildfire events in the area (as well as increased difficulties in dealing with fire events).

2.1. Establish a monitoring and information system

Description of the Action: Find and establish contact with the appropriate person at Local University to form a partnership that will coordinate university resources with the those of the community, to establish a hydrologic monitoring and information system.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Initiate Action: by May 31

Potential Sources of Technical Assistance: U.S. Department of Agriculture

Potential Sources of Financial Assistance: Possibly the Hydrologic Research Federal Project Grants described in the Catalog of Federal Domestic Assistance (CFDA program number 11.462) or the Watershed Surveys and Planning Program (CFDA 10.906).

2.2 Survey local problems

Description of the Action: Contact the local Farmers' Association and attend at least one of their summer meetings so as to survey local problems, resources and remedies.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Initiate Action: Summer after plan implementation.

Potential Sources of Financial Assistance: Local community foundation.

2.3 Prepare to implement identified projects

Description of the Action: Begin to implement the drought water reserve facilities projects detailed in the report by ABC Engineering for Maple Township (a low-income area that may qualify for federal grant assistance listed below).

Lead Manager Assigned: Mitigation staff.

Schedule to Complete Action: Apply for financial assistance by September 30.

Potential Sources of Financial Assistance: Emergency Community Water Assistance Project Grant (CFDA 10.763).

2.4 Draft a new plan

Description of the Action: Arrange for Local University faculty, research staff, or guided student groups to draft a new Drought Contingency Plan for the county.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Complete Action: the draft plan should be ready by the end of the year.

Potential Sources of Financial Assistance: None needed due to existing partnership.

3. Reduce the human and economic impacts of extreme summer heat

Description of the problem: Many residents of the county have their health and even their lives threatened by conditions during summer heat waves, due to a combination of their own vulnerability, lack of access to cooling equipment or cooler living/working facilities, and behavioral choices that render them vulnerable to the harmful effects of such weather.

3.1 Identify centers to designate as cooling areas

Description of the Action: Survey the community and recreational centers throughout the county and identify various areas that can be designated as "cooling shelters" where vulnerable residents can go to escape the effects of extreme summer heat.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Complete Action: Designations should be made before May 15.

Potential Sources of Financial Assistance: None needed.

3.2 Promote use of cooling shelters

Description of the Action: Once cooling shelters have been identified, their use shall be promoted through retirement networks, neighborhood organizations, and other participating organizations. Staff shall be appointed to visit known problem areas and encourage at-risk populations to use the shelters.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Complete Action: By June 15, each shelter should have at least a draft plan for notifying nearby residents of the potential health impacts of extreme heat, and identifying elderly (or other residents) who may have special needs to help determine strategies that will help them deal with heat problems under all likely conditions.

Potential Sources of Financial Assistance: None needed.

3.3 Promote public awareness of extreme temperature hazards

Description of the Action: Coordinate with the appropriate county health organizations (and other appropriate bodies) to promote public awareness of extreme temperature hazards and how to deal with them, especially in the event of power failures.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Coordination by March 31. The first public awareness activities should be under way no later than May 15.

Potential Sources of Financial Assistance: None needed.

3.4 Include schools in awareness efforts

Description of the Action: Contact local schools to ensure that their curriculum includes an awareness of severe summer weather hazards and how a family can prepare for and respond to them.

Lead Manager Assigned: Emergency Program Manager.

Schedule to Complete Action: Schools should be contacted by March 15.

Potential Sources of Financial Assistance: None needed.

4. Reduce the human and economic impacts of extreme winter cold

Description of the problem: Many residents of the county have their health and even their lives threatened during winter conditions of extreme cold, or even during prolonged periods of milder cold, due to inadequacies of their housing units to retain or be supplied with heat, or because of behavioral choices that render them vulnerable to the harmful effects of such weather.

4.1 Identify centers to designate as heating shelters

Description of the Action: Survey the community and recreational centers throughout the county and identify various areas that can be designated as "heating shelters" where vulnerable residents can go to escape the effects of extreme winter cold.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Complete Action: Designations should be made before September 30.

Potential Sources of Financial Assistance: None needed.

4.2 Promote the use of heating shelters

Description of the Action: Once heating shelters have been identified, their use shall be promoted through retirement networks, neighborhood organizations, and other participating organizations. Staff shall be appointed to visit known problem areas and encourage at-risk populations to use the shelters.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Complete Action: By October 15, each shelter should have at least a draft plan for notifying nearby residents of the potential health impacts of cool or freezing temperatures, and identifying elderly (or other residents) who may have special needs to help determine strategies that will help them deal with such problems under all likely conditions.

Potential Sources of Financial Assistance: None needed.

4.3 Promote public awareness of extreme temperature hazards

Description of the Action: Coordinate with the appropriate county health organizations (and other appropriate bodies) to promote public awareness of extreme temperature hazards and how to deal with them—especially in the event of power failures.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Coordination by August 31. The first public awareness activities should be under way no later than October 15.

Potential Sources of Financial Assistance: None needed.

4.4 Create a means to facilitate donations for heating assistance

Description of the Action: Meet with the representatives of the local utility providers, and contact local charitable organizations to work out a donation or financing system to ensure that all residents have heat during the winter, regardless of their ability to pay.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Meetings should be underway during the spring, and at least some financing mechanism or donations management system shall be effective by September 15 to start to deal with this issue.

Potential Sources of Financial Assistance: None needed to initiate meetings.

4.5 Include schools in awareness efforts

Description of the Action: Contact local schools to ensure that their curriculum includes an awareness of severe winter weather hazards and how a family can prepare for and respond to them.

Lead Manager Assigned: Emergency Program Manager.

Schedule to Complete Action: Schools should be contacted by October 15.

Potential Sources of Financial Assistance: None needed.

4.6 Volunteer outreach program

Description of the Action: Amateur radio operators and other volunteers shall be informed of the need to contact county residents who may be snowbound during or after blizzard events, and organized to be able to contact such persons and deliver goods or assistance to them in cases of a serious snow emergency.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Complete Action: To be included as a component of the county's Emergency Operations Plan by June 15.

Potential Sources of Financial Assistance: Voluntary contributions.

5. Reduce the risks and damages from wildfires in the county

Description of the problem: Many of the county's wildfires could be prevented through greater education, awareness, and alertness. Also, much of the damage and injury caused by wildfires could be prevented through legislation, code enforcement, homeowner awareness and property maintenance, and through adjustments in the planning, development and design process for area structures. Protective steps are especially needed in area of the River National Forest area. The county's hazard analysis has identified numerous rural roads and areas

where safe firefighter access is unlikely in the event of a major wildfire, due to poor road conditions, or limiting features of road design such as narrowness, slope, single directional access, lack of roundabouts, lack of passing spaces, lack of road name and address postings, excessive curves, excessive length of dead-end roads and driveways, and vegetative overgrowth over the roadway, including overhanging canopies of very flammable trees.

5.1 Create firebreaks

Description of the Action: Firebreaks must be created in the River National Forest area to help protect it and nearby property from forest fires. Lands will be acquired so as to achieve continuity of the needed firebreak areas identified in the county's hazard analysis. An investigation will be made into the availability of resources with which to create these firebreaks. If additional resources are found to be needed, applications or requests for those resources will be prepared and submitted.

Lead Manager Assigned: Emergency Program Manager.

Schedule to Initiate Action: Application for acquisition assistance should be submitted before September 30.

Potential Sources of Financial Assistance: Michigan Natural Resources Trust Fund.

5.2 Obtain extra fire-fighting equipment

Description of the Action: Two rural townships in the county may qualify for assistance through a Michigan Department of Natural Resources program and be able to acquire needed equipment for fire-fighting efforts.

Lead Manager Assigned: Emergency Program Manager.

Schedule to Initiate Action: Application for assistance should be submitted before February 1.

Potential Sources of Financial Assistance: Michigan Volunteer Fire Assistance Program.

5.3 Become a FIREWISE community

Description of the Action: The county shall announce by April 15 that it is officially adopting the recommendations and strategies to be a "FIREWISE community" and shall encourage all residents living in the wildland/urban interface area to become acquainted with FIREWISE mitigation strategies they can use to protect their property from wildfire hazards. This campaign should include the participation of all fire departments and many or most insurance agents, educational organizations, and homeowner associations, and will involve promotional activities, the distribution of informational materials (including its web address at http://www.Firewise.org/), and the possibility of fire inspections and wildfire risk inspections by local fire department personnel.

Lead Manager Assigned: Emergency Program Manager.

Schedule to Initiate Action: Application for assistance should be submitted before February 1.

Potential Sources of Financial Assistance: Financial assistance to some homeowners wishing to replace flammable roofing or deck materials may be available using the Very Low to Moderate Income Housing Loans Program (CFDA 10.410). Wealthier homeowners are probably eligible for loans from local financial institutions.

5.4 Revise county transportation plan

Description of the Action: The county's next revision of its transportation plan and road improvement project listings shall take into account those features of rural roads and driveways that inhibit safe fire-fighting efforts in

some areas, as identified in the county's hazard analysis. Emergency Management staff shall assemble a list of suggested improvements and present a written report on the subject to county transportation officials. Advice and information shall then be exchanged between divisions of county and local governments so as to implement projects that improve transportation access, evacuation capabilities, and safety of fire vehicles in rural areas vulnerable to wildfires.

Lead Manager Assigned: Emergency Management staff.

Schedule to Complete Action: Report to be submitted to county officials by October 31.

6. Reduce the county's vulnerability to thunderstorm hazards

Description of the problem: Limited public education efforts and advance warning capabilities currently render many of the county's residents vulnerable to severe thunderstorm hazards.

6.1 NOAA Weather Radio

Description of the Action: Timely access to NOAA weather information shall be maintained through upkeep on the aging radio tower in the west of the county, and by the installation of a new tower in the northeast of the county.

Lead Manager Assigned: The Emergency Program Manager and County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: Research and apply these opportunities by January 14.

Potential Sources of Financial Assistance: The county's community foundation, the Iron Corporate Giving Program, and possibly a Public Telecommunication Facilities Planning and Construction Grant (CFDA 11.550).

6.2 Alerting of those with special needs

Description of the Action: Through consultation with local community organizations, supplemental means will be identified by which isolated or special-needs populations can be alerted in the event of serious weather emergencies. This shall be done in conjunction with extreme temperature planning with these organizations, and a report on the topic shall be completed by mitigation staff.

Lead Manager Assigned: The Emergency Program Manager and County Hazard Mitigation Officer.

Schedule to Complete Action: Report to be completed by October 10.

Potential Sources of Financial Assistance: Local government support, if needed.

6.3 Educational program

Description of the Action: Community schools shall be contacted to ensure that their curriculum includes an awareness of severe thunderstorm hazards and how a family can prepare for and respond to them.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: Establish contact by March 15 with all area school districts.

Potential Sources of Financial Assistance: Not needed.

6.4 Volunteer communication network

Description of the Action: Coordinate the use of amateur radio operators to facilitate communications during times of emergency when phone lines may be inoperable, and include such procedures in the county's Emergency Operations Plan.

Lead Manager Assigned: The County Hazard Mitigation Officer, in conjunction with his or her snow emergency preparedness duties.

Schedule to Complete Action: September 15.

Potential Sources of Financial Assistance: Not needed.

7. Reduce the county's long-term vulnerability to Great Lakes shoreline flooding and erosion

Description of the problem: There are several known erosion areas along the lakefront side of the county, which in the near future will threaten vital recreation areas. There are also some historic structures threatened by shoreline flooding and erosion.

7.1 Historic preservation measures

Description of the Action: Meet with the local Historic Conservation Society and explore means to fund the floodproofing and possible relocation of many historic structures in floodplain and shoreline erosion areas.

Lead Manager Assigned: County Hazard Mitigation Officer.

Schedule to Complete Action: August 15.

Potential Sources of Financial Assistance: Historic Conservation Society fundraising, the area community foundation, or the Historic Preservation Fund Grants-in-Aid Program (CFDA 15.904).

7.2 Army Corps Assistance

Description of the Action: Apply for the Army Corps of Engineers to research and complete projects preventing erosion of critical shoreline areas, using the Beach Erosion Control Projects Program (CFDA 12.101)

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: May 15.

Potential Sources of Financial Assistance: U.S. Army Corps of Engineers.

7.3 Memorial Grounds protection

Description of the Action: The River Society shall be contacted to discuss fundraising mechanisms for projects to protect the River Memorial Grounds from erosion

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: April 30.

Potential Sources of Financial Assistance: To be determined.

8. Take steps to reduce property losses from large hail events

Description of the problem: Various structural reinforcements can help homeowners and businesses reduce damages from hail events in the area. Patrons of the Uphill Campground are especially vulnerable, since there are no solidly constructed structures located there. The historic Woodland Place has structures needing special reinforcement in order to resist damage from hail or other severe weather events.

8.1 Code Amendments

Description of the Action: Suggest to the County Board of Commissioners and local planning departments that local code requirements for campgrounds be amended to require the provision of at least one structure that can serve as a shelter area in the case of severe weather events.

Lead Manager Assigned: The County's Hazard Mitigation Officer.

Schedule to Complete Action: Meetings held before April 30.

Potential Sources of Financial Assistance: Not needed.

8.2 Historic preservation

Description of the Action: Meet with the local Historic Conservation Society to determine what fundraising mechanisms could finance the structural bracing and renovation of the historic structures in Woodland Place.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Complete Action: Meeting by June 15.

Potential Sources of Financial Assistance: To be determined.

9. Make the county's residents, property, and infrastructure safer from the effects of lightning strikes

Description of the problem: The county's communication system has been particularly vulnerable to lightning strikes. Phone systems (including 9-1-1) have failed numerous times due to lightning. Some of the urban structures in the county need protection from lightning strikes, such as the historic clock tower, which has been struck twice in the last decade.

9.1 Install lightning rods

Description of the Action: Lightning rods should be installed on all at-risk structures that are appropriate for it, according to the county's hazard analysis and NFPA-780 installation standards. This strategy will be encouraged and enforced by local and county code compliance officials.

Lead Manager Assigned: County Mitigation Officer.

Schedule to Complete Action: Part of official policy by December 31.

9.2 Communication alternatives

Description of the Action: Alternatives to the traditional communications media must be available during emergencies in case they fail or are overwhelmed. Coordinate with local amateur radio operators on this issue.

Lead Manager Assigned: The County Hazard Mitigation Officer.

Schedule to Complete Action: September 15.

Potential Sources of Financial Assistance: Not needed.

10. Reduce the harm caused by severe wind events in the county

Description of the Problem: Various measures can help reduce the losses endured by homeowners and businesses throughout the county from its annual severe wind events. Also, the historic Woodland Place has structures needing special reinforcement in order to withstand such severe weather events. The Gladness Trailer Park is especially vulnerable to damage from strong winds.

10.1 Historic preservation

Description of the Action: Meet with the Historic Conservation Society to determine what fundraising mechanisms could finance the structural bracing and renovation of the historic structures in Woodland Place.

Lead Manager Assigned: The County's Assistant Mitigation Officer.

Schedule to Complete Action: Discuss by June 15.

Potential Sources of Financial Assistance: To be determined.

10.2 Anchoring mobile home structures

Description of the Action: Consider establishing local codes requiring area mobile home residents to secure their units to a foundation so as to better resist severe wind effects that could cause the unit to tip or overturn. County mitigation staff shall draft a suggested ordinance or code amendment and submit it to the relevant authorities.

Lead Manager Assigned: Mitigation staff.

Schedule to Complete Action: To be submitted by May 31.

10.3 Window shuttering

Description of the Action: Homeowners should be encouraged to use protective shutters over their windows during severe weather events. Public education programs, insurance brochures, or other information dissemination media could be used. Insurance companies shall be contacted first about this initiative.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Complete Action: Discuss by July 31.

Potential Sources of Financial Assistance: Local Insurance companies.

10.4 Urban forestry

Description of the Action: All local jurisdictions and utility companies should be aware of the importance of urban forestry in mitigating damage from falling trees or tree limbs during strong wind events.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Complete Action: Contact MDNR for technical assistance, and locals for coordination/implementation, by March 31.

Potential Sources of Financial Assistance: Michigan Department of Natural Resources, Urban and Community Forestry Program.

11. Reduce the county's vulnerability to tornadoes

Description of the problem: As with strong winds (see preceding section), there are many areas of the county that are vulnerable to tornadoes, the strongest of all possible wind events. As with severe weather events in general, the county's warning system needs some improvements. In this section are strategies specific for tornadoes, in addition to the wind and severe weather mitigation actions described elsewhere in this plan.

11.1 Shelter areas

Description of the Action: Certain areas should have tornado shelters that are accessible to the public or nearby residents. Meetings with local mobile home park owners/proprietors shall occur to examine the feasibility of installing tornado shelter areas for park residents. Similar meetings will occur with the Downtown Development Authority and the Parks and Recreation Department concerning shelters for downtown and recreational areas. A report will be produced on the subject by mitigation staff.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Discuss by July 15.

11.2 Residential safe rooms

Description of the Action: Information about the benefits of safe room installation in homes shall be disseminated, and the construction of such rooms encouraged, through a presentation and display at the annual meeting of the local Farmer's Association.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Complete Action: The annual meeting of the Farmer's Association occurs in the summer.

Potential Sources of Financial Assistance: The Farmer's Home Administration, and possibly the Michigan State Housing Development Authority.

12. Reduce the county's vulnerability to severe winter weather hazards

Description of the problem: Limited public education efforts and advance warning capabilities currently render many of the county's residents and businesses quite vulnerable to severe winter weather events. In addition to actions already listed to mitigate the effects of extreme temperatures, the following strategy shall be implemented.

12.1 General public awareness

Description of the Action: Coordinate with county health departments and officials to promote public awareness of winter weather hazards and how to deal with them .

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: The first public awareness activities should be in the planning stages no later than May 15.

13. Reduce the damages and impacts caused ice, sleet, and snowstorms

Description of the problem: Portions of the area's electrical, communications, and transportation infrastructure are vulnerable to the effects of ice and sleet hazards. Periods of severe cold temperatures and major snow accumulation often cause traffic difficulties, frozen/broken pipes, other structural damages, and school shutdowns in the county. Urban forestry actions (see severe winds section) will be helpful, along with general winter and extreme temperature mitigation actions. In addition, there is another action proposed below.

13.1 Public awareness

Description of the Action: Coordinate with the Sheriff's Office and local police departments to promote public awareness of the dangers of ice and sleet for drivers, and the hazards of downed power lines and frozen/broken water pipes.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Discuss by August 15.

Potential Sources of Financial Assistance: Not needed.

14. Reduce the likelihood of personal and economic harm from civil disturbances

Description of the problem: Labor unrest in the county's largest city (Largetown) has been a problem since its founding in the late 1910s. This area remains a hot spot for demonstrations and violent activism on labor issues, as last year's major strike demonstrated. On the other side of the county is the Penitent Prison, which is subject to regular disturbances and even riots. At Local University, the stadium and arena buildings sometimes house events where the audiences get out of control and cause damage and disturbances.

14.1 Reduce violence from labor unrest

Description of the Action: Appropriate persons from the city, law enforcement, major industries, and labor organizations shall be contacted to help identify patterns and causes of violent disturbances, and to brainstorm ideas to reduce such violence or facilitate negotiations to calm and prevent it.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Initiate Action: Discuss by September 15.

Potential Sources of Financial Assistance: Not needed.

14.2 Reduce prison hazards

Description of the Action: Officials from Penitent Prison shall be contacted to assess possible needs and organize adjacent community responses and mutual aid, should the need be identified for assistance in quelling an uprising within that institution.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: Discuss by October 31.

Potential Sources of Financial Assistance: Not needed.

14.3 Reduce destruction from festivities

Description of the Action: Emergency site plans for the stadium and arena shall be updated, in consultation with university, city, and county planners and emergency management staff, and will include sections dealing with civil disturbances. Also being addressed at a broader planning level are possible regulations and re-design of nearby student housing areas and commercial districts, to reduce harm from large-scale festivities.

Lead Manager Assigned: Mitigation staff.

Schedule to Complete Action: Draft plan by December 15.

Potential Sources of Financial Assistance: Not needed.

15. Increase the county's capacity to withstand a military nuclear attack

Description of the problem: According to the Michigan Emergency Management Plan, the county has two targets identified as probable attack aim points in the FEMA attack planning guidance document, Nuclear Attack Planning Base (NAPB) – 1990. (The NAPB-1990 document provides the basis for the nuclear attack planning strategy adopted for Michigan.) Areas identified as aiming points are subject to the most severe direct weapon effects including blast, heat, fire, and radiation. A combination of evacuation and in-place sheltering is the best population protection alternative.

Alternate problem description for non-target areas: According to the Michigan Emergency Management Plan, the county is <u>not</u> identified as a probable attack aim point under the FEMA attack planning guidance document Nuclear Attack Planning Base (NAPB) – 1990. (The NAPB-1990 document provides the basis for the nuclear attack planning strategy adopted for Michigan.) Nonetheless, the county is still vulnerable to indirect weapon effects such as intense radiation and fallout from other attack aim points in the state. Therefore, the best population protection strategy is in-place sheltering in public shelters and home basements.

<u>15.1 Evacuation and sheltering plans</u>

Description of the Action: The county's evacuation and sheltering plans are currently being updated by planners and emergency management staff, and will include projects for new shelter areas and expanded road capacities that can better handle evacuation-related traffic flows.

Lead Manager Assigned: Mitigation staff.

Schedule to Complete Action: Revisions to be completed by December 20.

Potential Sources of Financial Assistance: Not needed.

<u>15.2 Safe room sheltering uses</u>

Description of the Action: "Safe rooms" designed for protection from tornadoes can also be used in many instances for sheltering from a nuclear attack (see strategy number 11.2). Support will be given for the construction of safe rooms for general emergency sheltering purposes.

See strategy number 11.2.

16. Increase the county's capacity to anticipate, manage, and withstand potential incidents involving sabotage, terrorism, or use of weapons of mass destruction

Description of the problem: The county's position as a government, business, education and research center makes it a potential target for a terrorist attack – possibly involving the use of weapons of mass destruction.

16.1 Agency coordination

Description of the Action: Meetings shall be scheduled to assist local law enforcement agencies in coordinating their preparedness and response capabilities so as to provide mutual aid when necessary. Action steps to be implemented as a result of these meetings include the adoption of an Incident Command System by all involved agencies, and the coordination of emergency communications equipment and protocols.

Lead Manager Assigned: The County's Hazard Mitigation Officer.

Schedule to Initiate Action: Meetings to begin by February 15.

Potential Sources of Financial Assistance: Not needed.

16.2 Information-sharing strategies

Description of the Action: A means will be organized, after conferring with law enforcement agencies at the local, state, and federal levels, to report and share information on potential terrorist organizations and activities. After preliminary meetings, strategies will be developed to include the media – possibly involving the provision of rewards to individuals who provide information or assistance for these efforts.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: Meetings will begin by January 15.

Potential Sources of Financial Assistance: Law enforcement agencies.

16.3 Planning for terrorist threats

Description of the Action: The emergency site plans that are currently being updated by planning and emergency management staff for Memorial Stadium and Central Arena will include sections dealing with terrorist-related threats.

Lead Manager Assigned: Mitigation staff.

Schedule to Complete Action: Discuss by December 15.

Potential Sources of Financial Assistance: Not needed.

17. Reduce the threat of potential public health emergencies

Description of the problem: The county is vulnerable to a wide variety of public health threats, including disease epidemics, food and water contamination, temporary loss of water and sewer services, exposure to chemical, biological or radiological agents, and infestations.

17.1 Maintain adequate monitoring and surveillance capabilities

Description of the Action: Work with Local University and the County Health Department to ensure adequate resources are in place to monitor public health threats and take the necessary steps to prevent or limit the scope and magnitude of threats that could escalate into public health emergencies.

Lead Manager Assigned: The Emergency Program Manager

Schedule to Initiate Action: Discussion should be underway by January 15.

Potential Sources of Financial Assistance: Local University.

17.2 Reducing infestations

Description of the Action: Investigate means of assisting farmers in eradicating infestations that may harm their products and threaten public health. A report will be produced and distributed on the topic.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: The report should be completed by May 1.

Potential Sources of Financial Assistance: Not needed to generate report.

17.3 Training and inspection assistance

Description of the Action: Training from the U.S. Department of Agriculture will be provided to officials from the County Health Department to assist in inspecting and maintaining the safety of foods at numerous points in their local production and supply chains.

Lead Manager Assigned: County Health Department Director.

Schedule to Complete Action: Training ends on November 12.

Potential Sources of Financial Assistance: Local industries, the U.S. Department of Agriculture.

18. Reduce the likelihood and potential effects of dam failures in the county

Description of the problem: The county has four high-hazard and three significant-hazard dams, located mainly in the northern part of the county. A partial or complete failure of one of these structures could endanger the lives and property of thousands of county residents.

18.1 Planning and mapping

Description of the Action: Areas and developments within the "hydraulic shadow" of the county's dams will be mapped as part of a local risk assessment on this hazard.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Complete Action: Assessment and mapping complete by January 5.

Potential Sources of Financial Assistance: Not needed.

18.2 Renovation of dams

Description of the Action: Local authorities and the Michigan Department of Environmental Quality will be consulted to determine how to assemble funds for renovating the Big River Dam and Maple Rapids Dam, both of which are in need of extensive repairs.

Lead Manager Assigned: The Emergency Program Manager

Schedule to Complete Action: Discuss by August 15.

Potential Sources of Financial Assistance: To be determined.

19. Reduce the risks of hazardous material fixed site incidents in the county, and increase the county's ability to respond to such incidents with a minimum of environmental, public safety, and economic impacts

Description of the problem: Several enterprises now deal regularly with large amounts of hazardous materials and require updates to their site emergency plans. There are 16 other SARA Title III Section 302 sites in the county which require special monitoring and planning activities by the Local Emergency Planning Committee (LEPC). The LEPC is currently in need of new and qualified members, due to recent turnover.

19.1 Update plans

Description of the Action: Assist sites in updating their Site Emergency Plans.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Discuss by October 15.

Potential Sources of Financial Assistance: Not needed.

19.2 LEPC strengthening

Description of the Action: Encourage and assist the LEPC in its activities relating to the development and review of SARA Title III Section 302 site emergency plans, and the search for qualified new members for the committee.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Chair will need replacement by May 10. Three other members will need to be replaced by October 31.

Potential Sources of Financial Assistance: Not needed.

20. Reduce the risk of damage, loss of life, and other costs resulting from transportation accidents

Description of the problem: The county is vulnerable to a wide array of transportation accidents, including air crashes, train derailments, and large-scale traffic accidents involving automobiles and buses. The major plane crash at Local Airport, caused by unauthorized recreational flights originating from the smaller Grass Strip Airport, was a tragedy that can clearly be avoided by the county in the future. The local school system also endured a near-disastrous school bus accident in 1998, and the Memorial Freeway outside the crowded metro business district in River City had a 45 car pile-up that caused it to be closed down for two days during the height of the annual tourist festival in 1999. The Express Railroad Line also poses some clear hazards, as many of its rural crossings in the hilly sections of the county's northwest are difficult to cross safely and truck and bus traffic are particularly at-risk.

20.1 Revise transportation procedures

Description of the Action: Airport and bus emergency procedures have been reviewed and amended in response to recent incidents, and re-training has begun using these procedures at Local Airport. Such techniques must be shared with surrounding airports. The county will continue to work with the Express Railroad Line to assess rural rail crossing hazards and identify required mitigative actions.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Complete Action: Organize transportation accident-reduction training and meetings before November 15.

Potential Sources of Financial Assistance: Provided by industry, school district, general funds.

20.2 Use new transportation technologies

Description of the Action: The Michigan Department of Transportation (MDOT), County Road Commission, and City of Maple Transportation Department have agreed to investigate and implement where possible pertinent aspects of new Intelligent Transportation System (ITS) technologies on the stretch of I-34 that passes through the county to assist in notifying drivers of hazardous conditions and facilitating smooth traffic flow.

Lead Manager Assigned: The City of Maple Transportation Department Technology Enhancement Division.

Schedule to Complete Action: Study complete by June 21.

Potential Sources of Financial Assistance: Not needed at this time.

20.3 Improve at-grade railroad crossings

Description of the Action: Improvements to dangerous at-grade crossings of the Express Railroad Line will be undertaken at locations determined by local, county, and regional transportation planners. A meeting of these planners will be called at the Regional Planning Commission to finalize development of a plan of action for accomplishing this.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: Initial Meeting to occur by May 15. Plan of action to be developed by November 15.

Potential Sources of Financial Assistance: Possibly Michigan Department of Transportation and the Michigan Rail Loan Assistance Program.

21. Increase the county's ability to deal with transportation accidents that involve hazardous materials, and reduce the effects of such incidents on the local communities

Description of the problem: The county has numerous roads that are used for the transport of hazardous materials. In addition, the Express Railroad Line that runs through River City, Maple Grove, and Prairie View also regularly carries shipments of hazardous materials. Smaller-scale transportation accidents involving hazardous materials occur regularly in the county. Larger-scale accidents requiring protective actions for nearby areas have been rare, but the possibility of such incidents always exists.

21.1 Changes in the area's transportation network

Description of the Action: Risk from transportation of hazardous materials should be reduced in the north of the county if the new expressway extension proceeds as planned through less densely-populated areas. Local efforts and ordinances shall be encouraged to cause signs to be installed and require routing of hazardous material shipments along this less-dangerous route whenever possible.

Lead Manager Assigned: Mitigation staff.

Schedule to Complete Action: Ongoing.

Potential Sources of Financial Assistance: Michigan Department of Transportation.

21.2 Response training

Description of the Action: The county's vulnerability to transportation incidents will be reduced by training response personnel to a higher level in hazardous material response, using the FY02 budget increases earmarked for this purpose.

Lead Manager Assigned: The County's Hazard Mitigation Officer.

Schedule to Initiate Action: First training session begins September 2.

Potential Sources of Financial Assistance: Earmarked in budget.

22. Decrease the county's vulnerability to infrastructure failures caused by accidents, system overload, or disaster damage

Description of the problem: The county is dependent on its network of public and private utility infrastructure to provide essential life-supporting services such as electric power, heating and air-conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems fail due to accidents, system overload, disaster damage, or other causes, the consequences can be severe. Unfortunately, the county has experienced several infrastructures failures in recent years that highlighted its tremendous vulnerability to these incidents. For example, the major power failure in the summer of 1997 caused many problems with traffic as the majority of Treeville's traffic signals failed to function properly. A convention that was scheduled in town at the time had to be cancelled due to the power outage. Area hospitals had a hard time caring for their patients under such conditions. A major water main break in 1999 flooded a nearby school (causing extensive damages), significantly reduced water pressure for firefighting, closed area businesses and government offices, and required the provision of bottled water to over 2,000 residents for a 72-hour period. Severe cold weather in 1992 caused a similar break and emergency conditions that lasted for nearly four days. Major system failures also occurred in 1994 (telephone service) and 1991 (sewage treatment plant damaged by flooding). Both of these incidents created emergency conditions that lasted for several days and adversely affected thousands of county residents.

22.1 Emergency generators

Description of the Action: The purchase and installation of power generators could provide short-term relief from power failures at critical facilities such as sewage pump stations, hospitals and medical centers, nursing home facilities, and traffic signals at high-priority intersections. Meetings will be held with utilities and local Public Works Departments to determine the resources and funding required to mitigate recurring infrastructure failures.

Lead Manager Assigned: The County's Hazard Mitigation Officer.

Schedule to Initiate Action: Discuss by November 15.

Potential Sources of Financial Assistance: To be determined.

22.2 Water line protection

Description of the Action: Several water supply lines in River City that have been determined to be vulnerable to ground freeze shall be buried below the frost line as part of the current fiscal year's Capital Improvement Program. Another water line that cannot easily be buried deeper will instead be fitted with extra insulation. Additional funding will be sought for similar future mitigative actions.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Initiate Action: Preliminary planning done by March 15, with summer implementation following.

Potential Sources of Financial Assistance: Department of Public Works.

22.3 Volunteer outreach

Description of the Action: A network of volunteers are needed to regularly check on the needs and conditions of the elderly, disabled and homebound persons, and other special-needs groups during and after severe weather conditions.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: Organized by September 1, active by October 15.

Potential Sources of Financial Assistance: A generous donation from the Iron Corporate Giving Program has provided funding for the initial organization and early operations of this volunteer network for its first year or so. Once active, some of its members will be assigned to investigate revenue sources that will allow it to continue operating.

23. Ensure that the county is adequately prepared to protect residents, property, and the environment in the event of a nuclear power plant accident or radiological release

Description of the problem: The county is located within the 50 mile Emergency Planning Zone (EPZ) for the Enrico D. C. Palisades Nuclear Plant. In addition, the nuclear research facility at Local University works with significant quantities of enriched uranium, plutonium, and other sources of ionizing radiation.

23.1 Exercises

Description of the Action: Develop a functional exercise to test and enhance preparedness and response procedures for a radiological release at the nuclear research facility at Local University.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Initiate Action: Exercise should be developed by October 31 and then held in early December.

Potential Sources of Financial Assistance: Local University; other participating agencies and communities.

23.2 Revised site plan

Description of the Action: Revise the site emergency plans for the Local University nuclear research facility, and promote agency and responder awareness and coordination with these plans to the fullest extent possible.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Complete Action: Plan revisions should be complete by February 15; awareness and coordination meetings should be held by June 15.

Potential Sources of Financial Assistance: Local University.

23.3 Improve warning system coverage and effectiveness

Description of the Action: Install new warning sirens in the southern sections of the county, and identify areas where additional sirens may also be needed. Investigate the feasibility of alternative warning systems and produce a written report on the topic.

Lead Manager Assigned: The County's Hazard Mitigation Officer.

Schedule to Initiate Action: Siren installation in the southern sections to be completed by June 1. Report to be completed by September 15.

Potential Sources of Financial/Technical Assistance: Federal Emergency Management Agency.

24. Decrease the potential harm from industrial accidents involving the county's petroleum and natural gas wells, pipelines, storage tanks, and refineries

Description of the problem: Wells have not always been adequately protected against the wildfire hazards present in the county's forested areas. Some pipelines in the county pass through very heavily populated and densely-developed areas.

24.1 Wildfire protection

Description of the Action: Oil and gas production facilities, property, and equipment will be protected against the possibility of wildfires to the greatest extent possible. To do this, production companies and land owners will employ FIREWISE principles of proper grounds maintenance, equipment storage, vegetation clearance, and other techniques, as related to them at the recent FIREWISE workshop organized by the county's Emergency Program Manager.

Lead Manager Assigned: The Emergency Program Manager; local code enforcement officials.

Schedule to Initiate Action: Facilities will be reviewed during the month of May.

Potential Sources of Financial/Technical Assistance: Involved companies; local fire departments.

25. Reduce the county's vulnerability to scrap tire fires

Description of the problem: Several large storage sites for scrap tires (holding a total in excess of 2,000,000 tires) have been identified in the county's hazard analysis. A major lawsuit was filed against one of these for the environmentally disastrous fire that spread through their 300,000-tire scrap pile in late March. Neighbors around other sites report that prolific mosquito breeding constitutes a tangible nuisance and public health problem.

25.1 Compliance with MDEQ regulations

Description of the Action: Tires at the county's known and licensed storage locations will be inspected regularly and concerns reported to the Michigan Department of Environmental Quality. The regulations of that department's Scrap Tire Regulatory Program will be strictly enforced.

Lead Manager Assigned: The County's Hazard Mitigation Officer; officials from MDEQ.

Schedule to Initiate Action: Additional inspections scheduled to begin in April.

Potential Sources of Financial Assistance: Storage site proprietors (fees and fines authorized by a local ordinance that is expected to pass on February 6); MDEQ.

25.2 Local processing of scrap tires

Description of the Action: An agreement will be sought between the currently licensed scrap tire storage areas and the Grindemup Processing Plant and Energy Center, to provide for the Plant to use local tires in its energy-producing activities.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer; representatives of the involved companies.

Schedule to Initiate Action: Initial business meetings scheduled for November 4.

Potential Sources of Financial Assistance: Not needed.

25.3 Denial of permit to operate

Description of the Action: One of the identified scrap tire storage areas (the Mile-High Tire Recycling Company) will not be allowed to operate in the county until economic, legal, and regulatory requirements have been complied with.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Initiate Action: Site closed until required operating conditions are met.

Potential Sources of Technical Assistance: Local code enforcement officials; MDEQ district staff.

26. Reduce the county's losses from structural and industrial fires

Description of the problem: The county currently has over 150,000 residential, commercial, and industrial structures – over 40% of which were built before World War II. In addition, many dormitories at the Local University, and several high-rise structures in downtown River City, either lack sprinkler facilities altogether or have determined that existing systems require maintenance and upgrading. Several of the older community business districts date back as far as the 1860s and are at higher risk from fires.

26.1 Sprinkler system installation

Description of the Action: The Local University dormitories are now required to have sprinkler systems. Installation of the new systems will be completed before the new school year begins on August 20.

Lead Manager Assigned: The County's Hazard Mitigation Officer; university fire officials.

Schedule to Initiate Action: Will begin at the beginning of the summer semester on May 20 and end before August 20.

Potential Sources of Financial Assistance: Local University; State Legislature.

26.2 Sprinkler upgrade in high-rise towers

Description of the Action: Plans are being developed for a major renovation to the Tall Tower building in downtown River City, one of several structures currently not in compliance with the requirements of the city's new fire safety ordinance.

Lead Manager Assigned: The County's Assistant Hazard Mitigation Officer.

Schedule to Initiate Action: Plans should be complete by January 4; the sprinkler system should be completely installed by December 31.

Potential Sources of Financial Assistance: Tall Tower Property Management, Inc.

26.3 Firewalls and design alterations in old "Main Street" areas

Description of the Action: Old "Main Street" mixed-use districts in River City, Prairie View, and Maple Grove will be altered or reconstructed with improved designs and more effective firewall separations between adjacent units to help prevent fire spread from occurring in the future. These activities are part of planned community downtown renovations being funded under the Community Development Block Grant (CDBG) program.

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Initiate Action: Construction begins in River City on March 5 and in Prairie View and Maple Grove in July.

Potential Sources of Financial Assistance: CDBG funds; historic preservation funds; Main Street Program funds; business and insurance contributions and subsidies.

27. Reduce the risk of damage and loss of life from subsidence in the county's old mining areas

Description of the problem: The locations of many of the county's old mines are not precisely known, but some have recently been found underlying areas of major roads and development. According to the county's hazard analysis, subsidence could cause serious problems throughout most of the northwest quadrant of the county.

27.1 Locate all old mining areas

Description of the Action: As a result of last November's meeting with the county's historical society, the society's members have agreed to perform an exhaustive search of local records to locate all possible information on the location of old mines in the county. They will report their findings to the county emergency management office. Coordination will be maintained with the Michigan Department of Environmental Quality's Geological Survey Division.

Lead Manager Assigned: Members of the county's historical society.

Schedule to Complete Action: Findings of historical research are anticipated by December 31.

Potential Sources of Financial Assistance: Not needed – volunteer effort.

27.2 Field research on subsidence threat

Description of the Action: The County Planning Commission, local building inspectors, and the Regional Planning Commission have begun extensive interviews with local property owners to locate areas that are at risk from land subsidence. Projects will be identified from this study, some of which will be submitted by the Regional Planning Commission for funding assistance under the federal Rural Abandoned Mine Program (CFDA 10.910).

Lead Manager Assigned: The Emergency Program Manager.

Schedule to Initiate Action: Surveys will commence by February 1, with completion expected by December 31.

Potential Sources of Financial Assistance: Historic preservation funds; Main Street Program funds; business and insurance contributions and subsidies.

(END OF MITIGATION STRATEGY EXAMPLES)

Monitoring and Periodic Revision of the Plan

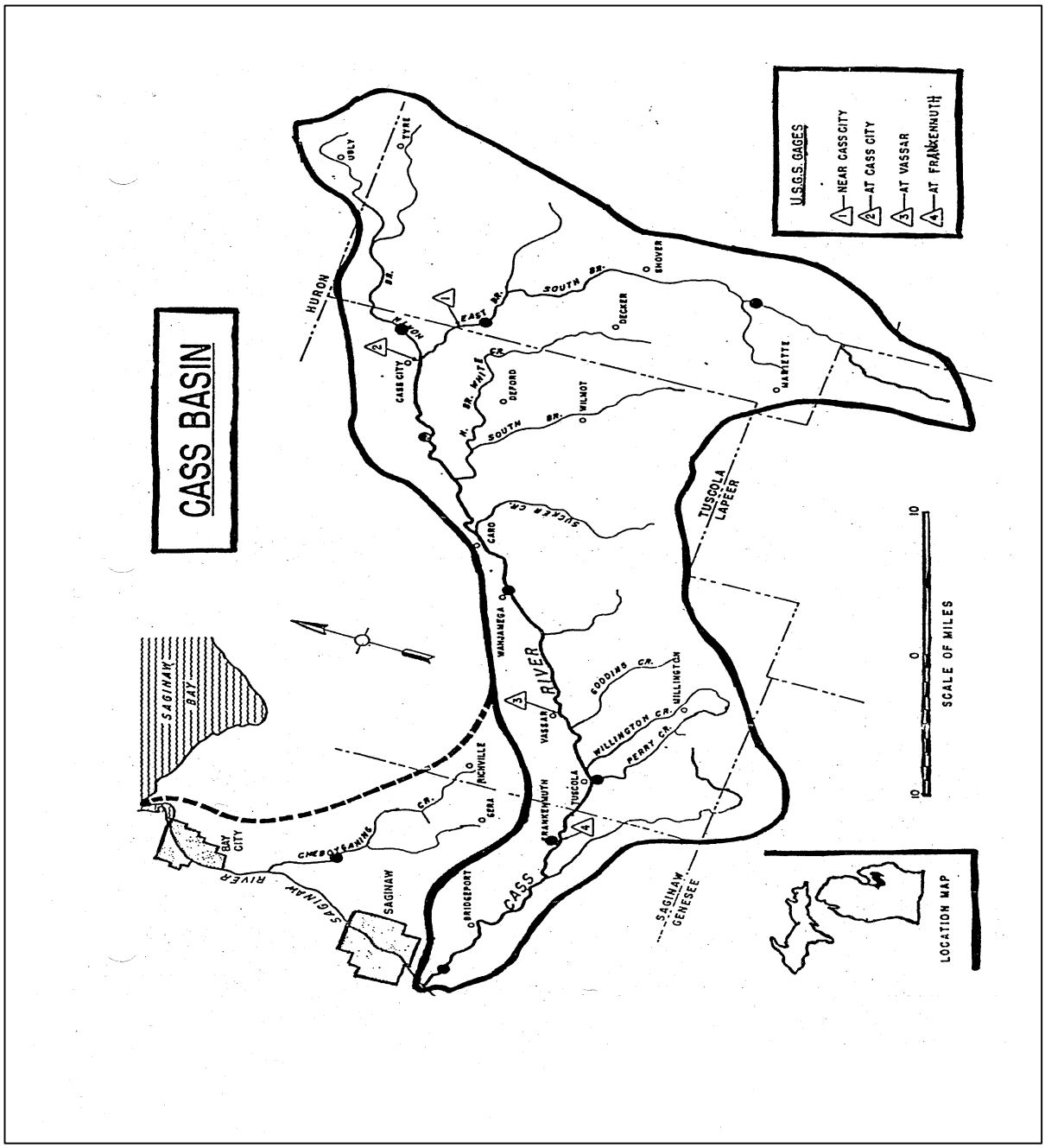
The plan will be monitored on a regular basis by **(list responsible party[ies])**. Because **(name of community)** is a dynamic, constantly changing community, it is expected that the plan will be revised frequently. Plan evaluation and maintenance are the responsibility of **(list the responsible party[ies], which should include a local hazard mitigation committee and methods of obtaining public input as described in the Preliminary Steps sections of this document)**. The plan will be reviewed on an annual basis by **(list the responsible party[ies])** and, if necessary, revised. Proposed changes in the plan will be presented to the **(list community body)** as needed, but not less than annually. Although review of the plan will occur annually, and a formal revision may not be needed each year, a new edition of the plan will be expected within every five year period, based on annual reviews, monitoring, evaluation, and an accumulation of official feedback and public input. When it is appropriate to publish a revised version of the plan, **(list the responsible party[ies])**, (or the equivalent agencies and officials in place at that future time), shall again be involved in the revision process. The revised plan will again be officially adopted by **(list community body)**.

In that hazard mitigation is a program in its infancy as a formal process, it is critical to monitor progress on the plan to keep the process moving forward. The hazard mitigation plan should be updated annually following its implementation until the process has become an ingrained practice. Goals and objectives should be reviewed quarterly. Each individual assigned an objective should be required to provide a brief progress report. If problems are being encountered, a meeting may be necessary to initiate a barrier removal process.

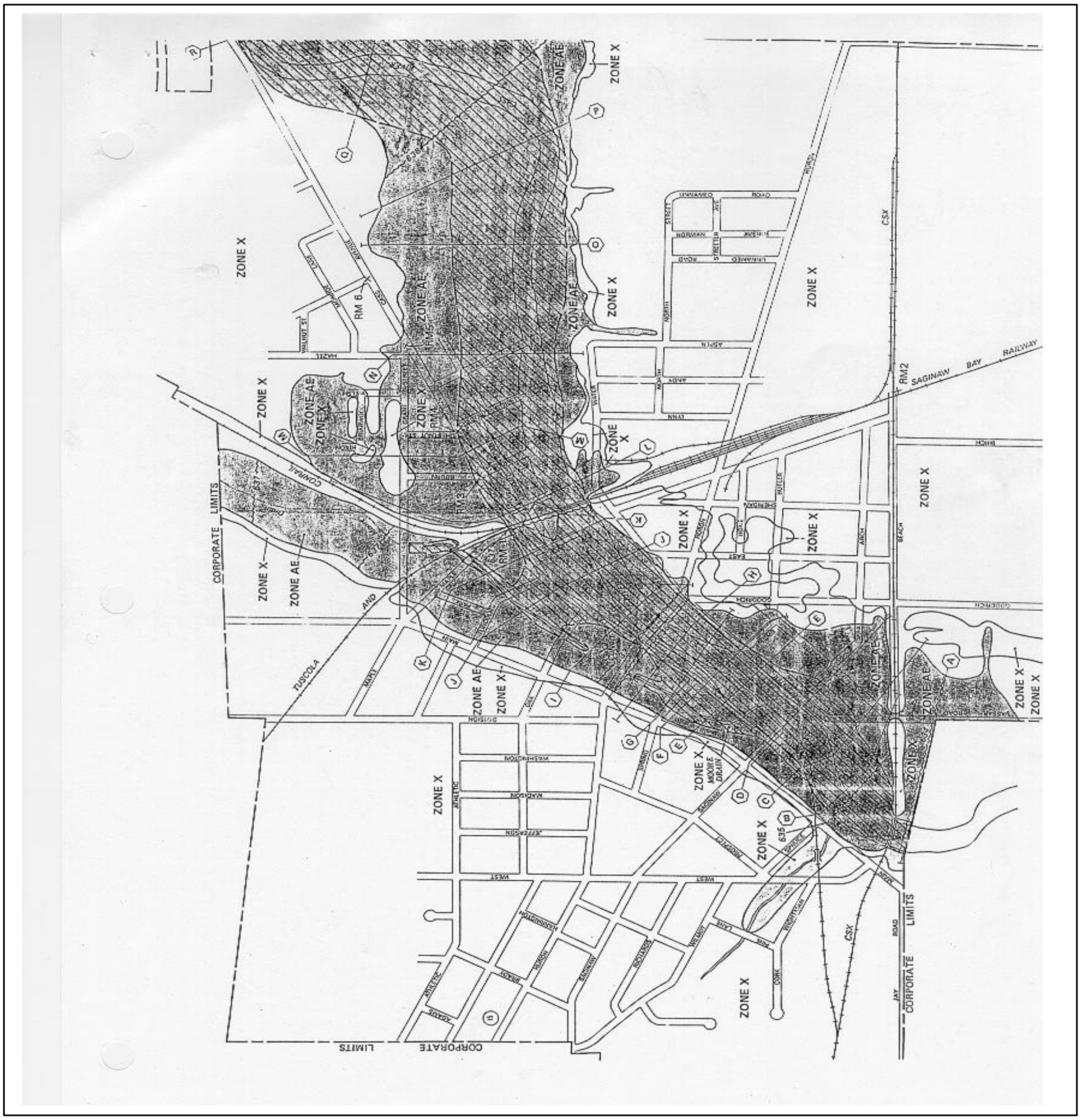
NOTE: THIS AND THE 9 PAGES FOLLOWING CONTAIN ATTACHMENTS FROM THE CITY OF VASSAR HAZARD MITIGATION PLAN, INCLUDING EXAMPLES OF THE SORT OF DETAIL THAT IS USEFUL AND REQUIRED FOR A PLAN TO CONFORM WITH THE REQUIREMENTS OF THE FLOOD MITIGATION ASSISTANCE PROGRAM (FMAP).

Acronyms

ACP	Association of Contingency Planners
ARC	American Red Cross
ASFPM	Association of State Floodplain Managers
BFE	Base Flood Elevation (Base Flood is the same as the 100-Year Flood, or 1% event)
CBD	Central Business District
CDBG	Community Development Block Grant (HUD program)
CPT	Community Planning Team
CRS	Community Rating System (NFIP program)
DDA	Downtown Development Authority
DEQ	Department of Environmental Quality (Michigan)
EDA	Economic Development Agency (Federal Department of Commerce Program)
EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
FHwA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance (NFIP program)
GIS	Geographic Information System
HMGP	Hazard Mitigation Grant Program (FEMA program)
HUD	Department of Housing and Urban Development
ICC	Increased Cost of Compliance
ISO	Insurance Services Organization
MDOT	Michigan Department of Transportation
MOM	Multi-Objective Management
MOU	Memorandum of Understanding
NFIP	National Flood Insurance Program
NRCS	Natural Resource Conservation Program
NWS	National Weather Service
SBA	Small Business Administration
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey


CASS BASIN
U.S.G.S. GAGES
1 NEAR CASS CITY
2 AT CASS CITY
3 AT VASSAR
4 AT FRANKENMUTH
HURON
CASS
SAGINAW
GENESEE
TUSCOLA
LAPEER
SAGINAW BAY
SAGINAW RIVER
VASSAR
RIVER
SCALE OF MILES
LOCATION MAP

Map of Vassar



DEFINITIONS

B	Basement
BK	Brick
C	Commercial
CBC	Concrete Block Construction
CO	City Owned
COND	Condition of Building (1 = essentially not salvageable; 10 = new)
CS	Crawl Space
Depth 1	Depth of Flood = Flood Elevation – LAG
Depth 2	Depth above First Floor = Flood Elevation – LF
Flood Elev.	100 – year (1% chance) Flood Elevation
FLDWY	Located within the Designated Floodway
LAG	Lowest Adjacent Ground Elevation
LF	Lowest Floor Elevation (excluding standard basements)
LO	Lowest Opening into Structure
R	Residential-Single Family
RMF	Residential-Multi Family
SOG	Slab on Grade
STN	Stone
WF	Wood Frame

CITY OF VASSAR, MICHIGAN

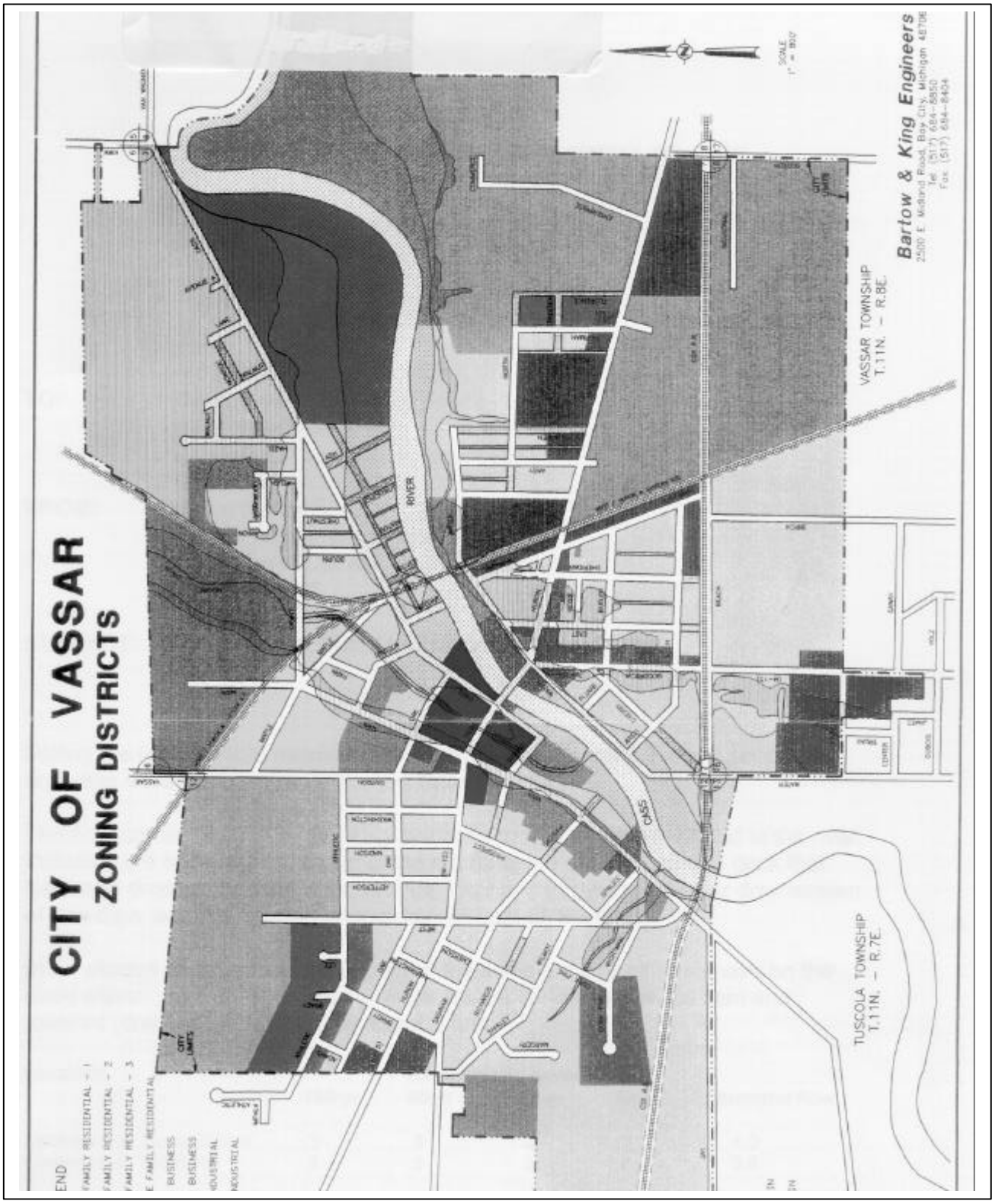
FLOOD INVENTORY, March 1998

ADDRESS	USE	TYPE CONST	COND	ASS'D VALUE	FDWY	FLOOD ELEV	LF	LAG	LO	DEPTH 1	DEPTH 2
ARCH											
219	R	WF B	1	1,000	YES	635.6	630.7	626.9		8.7	4.9
254	R	WF B	4	16,200	NO	635.6	633.2	630.6	631.1	5.0	2.5
260	R	WF CS	7	25,100	NO	635.6	632.0	630.3		5.3	1.3
267	R	WF B	6	29,900	NO	635.6	634.6	632.6		3.0	1.0
268	R	WF CS	9	39,500	NO	635.6	632.9	630.9		4.7	2.7
274	R	WF B	4	19,800	NO	635.6	634.7	631.9	632.3	3.7	0.9
278	R	WF B	5	21,800	NO	635.6	635.9	633.2	633.2	2.4	
279	R	WF B	8	18,400	NO	635.6	638.1	634.7	635.2	0.9	
282	R	WF B	7	18,800	NO	635.6	637.1	634.7	634.7	0.9	
BOURN											
508	R	WF CS	7	10,200	NO	637.5	633.9	631.2		6.3	2.7
511	R	WF B	8	28,300	NO	637.5	634.2	631.9	631.9	5.6	3.3
517	R	BK CS	8	33,400	NO	637.5	634.2	632.8		4.7	3.3
528	R	WF B	8	25,200	NO	637.5	636.0	633.3	633.3	4.2	1.5
532	R	WF B	8	25,000	NO	637.5	634.6	634.0	634.0	3.5	2.9
537	R	WF B	7	25,600	NO	637.5	637.5	635.8	635.8	1.7	
540	R	WF CS	6	12,900	NO	637.5	636.2	634.7		2.8	1.3
546	R	WF B	8	31,500	NO	637.5	638.0	635.6	635.9	1.9	
CASS											
118	C	CBC SOG	5		YES	636.4	630.3	630.3	630.3	6.1	6.1
119	C/R	WF/BK B	1	14,600	NO	636.4	632.5	630.2	630.2	6.2	3.9
121/123	RMF	WF B	5	16,900	YES	636.4	631.1	631.0	631.1	5.4	5.3
126	R	WF B	2	13,200	YES	636.4	632.3	629.9		6.5	4.1
127	R	WF B	6	14,100	YES	636.4	634.4	631.8	631.8	4.6	2.0
133	R	WF B	7	28,100	YES	636.5	636.3	632.7	632.7	3.8	0.2
200	R	WF B	6	32,400	YES	636.5	635.3	630.3	631.7	6.2	1.2
203	R	BK CS	3	24,100	YES	636.7	636.0	633.0		3.7	0.7
209	R	WF B	8	21,600	YES	636.7	635.6	632.9	632.9	3.8	1.1
221	R	WF B	3	16,600	YES	636.7	634.2	632.1	632.1	4.6	2.5
227	R	WF CS	4	13,500	YES	636.7	632.7	631.9		4.8	4.0
301	RMF	WF B	7	18,700	YES	636.7	631.3	629.0	629.0	7.7	5.4
305	C	WF CS	8	CO	YES	636.7	632.5	630.2		6.5	4.2
312	R	STN B	7	22,600	YES	636.7	632.4	629.6	629.9	7.1	4.3
321	R	WF B	2	1,900	NO	636.9	630.8	628.3	628.3	8.6	6.1
337	R	WF B	5	16,400	NO	637.0	630.6	627.1	627.1	9.9	6.4
419	R	WF B	5	19,400	NO	637.4	634.2	631.2	631.3	6.2	3.2
426	R	WF CS	5	13,600	YES	637.5	632.9	631.4		6.1	4.6
429	R	WF/BF B	7	15,000	YES	637.5	633.6	630.9	632.1	6.6	3.9
506	R	WF B	8	15,100	YES	637.5	636.0	632.3	633.1	5.2	1.5
512	R	WF B	8	18,400	YES	637.5	635.4	632.6	None	4.9	2.1
515	R	WF B	7	13,000	YES	637.5	635.4	631.4	633.4	6.1	2.1
520	R	WF CS	6	13,900	YES	637.5	635.8	632.3		5.2	1.7
526	R	WF B	8	21,700	YES	637.5	636.2	632.2	None	5.3	1.3
600	R	WF B	8	16,400	YES	637.5	632.1	630.0	None	7.5	5.4
615	R	WF B	7	23,200	NO	637.5	636.8	631.8	635.4	5.7	0.7
619	R	WF B	7	25,200	NO	637.5	636.3	635.1	633.1	2.4	1.2
620	R	WF B	8	14,000	NO	637.5	634.4	632.5		5.0	3.1
623	R	WF B	7	17,200	NO	637.5	637.3	633.5	635.0	4.0	0.2
626	R	WF B	7	18.300	NO	637.5	636.0	632.4		5.1	1.5
627	R	WF CS	6	27,800	NO	637.5	636.4	634.1		3.4	1.1
633	R	WF B	7	30,200	NO	637.6	639.4	634.8		2.8	
634	R	WF B	7	16,500	NO	637.6	637.7	636.1	636.3	1.5	
716	R	WF B	7	23,300	NO	637.6	639.4	637.1	637.1	0.5	
717	R	WF CS	7	20,300	NO	637.6	638.5	636.9		0.7	

ADDRESS	USE	TYPE CONST	COND	ASS'D VALUE	FDWY	FLOOD ELEV	LF	LAG	LO	DEPTH 1	DEPTH 2
719	R	WF CS	6	12,700	NO	637.6	637.3	636.4		1.2	0.3
728	R	WF B	6	17,600	NO	637.6	639.0	636.9	636.9	0.7	
801	R	WF B	8	25,700	NO	637.6	640.3	636.9	637.5	0.7	
802	R	WF B	7	29,200	NO	637.6	637.4	636.5	636.9	1.1	0.2
808	R	WF B	7	12,800	NO	637.6	639.3	637.1	637.7	0.5	
CHERRY											
218	R	WF	B	21,300	NO	635.7	634.7	631.2	631.5	4.5	1.0
223	RMF	WF	B	19,200	NO	635.7	636.7	634.6	634.6	1.1	
224	RMF	WF	B	15,000	NO	635.7	635.1	631.3	631.3	4.4	0.6
231	R	WF	B	22,400	NO	635.6	636.1	632.4	633,4	3.2	
236	R	WF	CS	34,400	NO	635.6	633.1	631.1		4.5	2.5
237	R	WF	B	14,800	NO	635.6	632.3	631.8		3.8	3.3
240	R	WF	CS	1,700	NO	635.6	632.8	630.8		4.8	2.8
243	R	WF	CS	21,700	NO	635.6	633.4	632.0		3.6	2.2
245	R	WF	B	20,700	NO	635.6	632.1	630.3	630.6	5.3	3.5
246	R	WF	B	18,800	NO	635.6	632.7	628.9	630.5	6.7	2.9
CHESNUT											
529	R	WF B	6	11,300	NO	637.5	636.0	634.7	634.7	2.8	1.5
537	R	WF CS	7	12,300	NO	637.5	637.2	634.3		3.2	0.3
542	R	WF CS	7	20,300	NO	637.5	636.0	634.8		2.7	1.5
552	R	WF B	7	25,200	NO	637.5	637.1	635.3	635.3	2.2	0.4
EAST											
124	R	WF B	4		NO	636.6	639.5	636.7	636.7	NFP	
GRANT											
420	R	WF B	8	34,500	NO	637.4	639.9	637.4	637.4	NFP	
423	R	WF B	4	19,000	NO	637.4	638.5	631.5	631.5		5.9
528	R	WF CS	5	11,000	NO	637.5	637.2	635.7		1.8	0.3
530	R	WF B	9	26,900	NO	637.5	637.6	635.2	635.2	2.3	
616	R	WF CS	9	16,800	NO	637.5	637.9	636.3		1.2	
657	R	WF CS	9	11,000	NO	637.6	639.3	636.3		1.3	
HURON											
119	C/RMF	BK B	6	29,100	NO	636.0	636.4			NFP	
120	C/RMF	BK B	5	29,200	NO	636.0	635.8				0.2
125	C/RMF	BK	6	23,600	NO	636.0	634.0				2.0
126	C/RMF	BK B	7	15,300	NO	636.0	633.5				2.5
HURON											
134	C	BK	7	12,900	NO	636.0	632.2				3.8
135		BK	6	13,900	NO	636.0	631.2				4.8
139	C/RMF	BK	5	21,400	NO	636.0	630.2				5.8
140	C	BK B	6	36,900	NO	636.0	630.1				5.9
145	C	WF	4	23,000	NO	636.0	629.9				6.1
152	C	BK	1	2,900	NO	636.0	629.3				6.7
161	C/RMF	WF	4	15,200	NO	636.0	628.8				7.2
164	C	WF	7	12,900	NO	636.0	628.9				7.1
165	C/RMF	WF	6	17,900	NO	636.0	629.8				6.2
171/179	C/RMF	BK	6	59,000	NO	636.0	628.4				7.6
195	C/RMF	CONC	6	43,500	NO	636.0	631.2				4.8
287	C	BK	9	CO	YES	636.5	629.7	629.4	629.7	7.1	6.8
288	C	BK SOG	8	30,900	YES	636.0	634.6	634.0		2.0	1.4
302	C	BK SOG	8	14,400	NO	636.0	635.4	635.4		0.6	0.6
310	C	WF CS	7	36,200	NO	636.0	636.4	635.5		0.5	
314	R	WF B	6	12,700	NO	636.0	640.5	636.8	636.8	NFP	
S. MAIN											
100	C/RMF	BK B	5	32,500	NO	636.0	639.4			NFP	
101	C/RMF	BK B	5	25,800	NO	636.0	640.2		637.1	NFP	
201/203	RMF	WF B	8	26,600	NO	635.6	635.1	631.2	631.5	4.4	0.5
221	RMF	WF CS	7	20,700	NO	635.6	634.7	630.6		5.0	0.9
227	R	WF B	5	20,600	NO	635.6	637.1	630.4	634.3	5.2	
233	R	WF CS	6	22,400	NO	635.6	634.0	627.6		8.0	1.6
ADDRESS	USE	TYPE CONST	COND	ASS'D VALUE	FDWY	FLOOD ELEV	LF	LAG	LO	DEPTH 1	DEPTH 2

MAPLE											
204	R	WF B	6	7,500	NO	636.7	638.0	641.0	641.0	NFP	
209	R	WF B	6	18,100	NO	636.7	636.7	634.4	634.4	4.3	
213	R	WF CS	6	14,100	NO	636.7	633.4			4.8	3.3
218	R	WF B	1	23,800	NO	636.7	638.5	636.4	636.4	0.3	
OAK											
114	R	WF B	4	17,700	NO	636.5	636.7	632.0	633.4	4.5	
115	R	WF CS	7	23,300	NO	636.5	638.3	635.3		1.2	
121	R	WF B	7	18,100	NO	636.5	633.3	630.4	630.9	6.1	3.2
129	R	WF B	2	12,800	NO	636.5	631.9	627.7	628.4	8.8	4.6
PARK											
318	R	WF CS	9	32,100	NO	636.7	637.2	635.2		1.5	
PLUMB											
210	R	WF B	2	13,200	NO	635.6	634.1	632.0		3.6	1.5
215	R	WF CS	5	14,100	NO	635.6	635.0	633.2		2.4	0.6
220/222	RMF	WF B	4	23,200	NO	635.6	635.7	633.4	2.2	2.2	
SPRING											
136	C	WF	6		YES	635.6	631.4	626.8	631.4	8.8	4.2
Warehouse	C	BK	5	CO	YES	635.6	630.7	629.2	630.7	6.4	4.9
S. WATER											
1	C	CBC CS	3	9,500	YES	635.7	634.2	633.8		1.9	1.5
120	R	WF B	3	7,400	NO	635.6	634.5	631.1	633.2	4.5	1.1
133	R	WF	4	12,400	NO	635.6	634.0	632.9	633.3	2.7	1.6
211	R	WF CS	4	9,000	NO	635.6	635.2	630.3		5.3	0.4
215	R	WF CS	1	1,200	NO	635.6	633.2	631.4		4.2	2.4
223	C	CBC SOG	2	?	NO	635.6	632.7	632.1		3.5	2.9
225	R	WF SOG	4	9,100	NO	635.6	631.1	629.8		5.8	4.5
243	R	WF CS	2	8,700	NO	635.6	631.6	627.5		8.1	4.0
N. WATER											
Mart	C	WF SOG	7	69,500	NO	636.4	636.8	636.4		NFP	
Café	C	WF SOG	7	53,200	NO	636.5	636.3	635.6		0.9	0.2
221	C	CBC BK	6	69,400	YES	636.6	Wk. 634.1 off. 636.0	630.4		6.2	2.5 0.6
501	C	WF/CBC	5	113,700	YES	637.5	Wk. 637.7 Off.638. 3	636.7 638.0		0.8	

NFP = Not Flood Prone


CITY OF VASSAR
ZONING DISTRICTS
Bartow & King Engineers
VASSAR TOWNSHIP
T.11N. - R.8E.
TUSCOLA TOWNSHIP
T.11N. - R.7E.
CASS
RIVER

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 5, 1998

TO: George Hosek
NFIP Coordinator
Land and Water Management Division

FROM: Bruce Menerey
Flood Hazard Management
Land and Water Management Division

SUBJECT: City of Vassar, Flood Mitigation Assistance

During the May 4, 1998 meeting of the Community Planning Team a couple of concerns were raised in regard to the Cass River.

The first concern was in regard to restrictions to flow that have formed in the river, including the sediment upstream of the old dam, the old M-13 bridge deck that had been dropped into the river, islands that have formed in the river downstream of the dam, and the railroad bridge downstream of the dam.

In an attempt to determine the impact of the sediment and old dam have on the flood elevations, I modified the hydraulic model to remove the old dam and lowered (dredge) the channel by about 3 feet.

Location	**Reduction in water level, ft**				
	100-yr	**50-yr**	**10-yr**	**2-yr**	**summer flow**
Upstream of Huron Street	.3	.3	.2	.1	4.0
Upstream of T&SB RR	.5	.3	.2	.2	3.8

The results indicate that the primary impact of removing dam and sediment would be on the low flows. There would be a slight decrease in the flood elevations upstream of Huron Street and the Tuscola and Saginaw Bay Railroad crossing primarily as a result of increased bridge opening due to the dredging. If the old dam is removed, the accumulated sediments would likely wash downstream, and the community could be liable for any damages caused by the increased sedimentation. It would be necessary to remove the sediments before removing the dam.

Removal of downstream railroad crossing
If the downstream railroad bridge were totally removed, 100-year flood stages, downstream of Huron Street may lowered about .4 feet (the impact on the flood elevations for lower floods would be less). There would minimal impact upstream of Huron Street. The flood elevations upstream of Huron Street are primarily controlled by the Huron Street bridge opening, and the elevation of Huron Street. Minor changes in flood elevations downstream of Huron Street will negligible impact upstream of the bridge.

Removal of downstream islands
The hydraulic analysis was modified to try to show the removal of the islands. The results of the analysis indicate that if the islands downstream of the dam were removed, the impact on the flood profiles would **less than .1 feet**, downstream of Huron Street, and that there would essentially be no impact upstream of Huron Street.

Environmentally, the dredging and/or removal of the islands, would experience significant opposition from both DNR Fisheries Division, and National Fish & Wildlife Service.

Effects of changing Land Use

The second concern was in regard to what impact that upstream draining of wetlands and tiling of farm fields has had on flood flows. There has not been any detailed studies done on the Cass River basin which looks at the long term effect of draining upstream wetlands. Intuitively I would expect some increase in peak flows, a decrease in low (drought) flows, and a quicker time for floods to peak. Since floods vary due to rainfall, snow cover, temperature, time of the year, etc., it is difficult say what the trend has been over the years. The best approach to determine the impact would be to develop a basin wide hydrologic model and look at changing land uses over the years. Along that same line, the model could also indicate the impact of restoring wetlands in the watershed. This modeling may be something that the Corps of Engineers could do under Floodplain Management Services.